THE IRON TRADE REVIEW

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THE WEEK IN IRON CIRCLES.

THE MARKET AT LARGE.

More of a disposition to buy for the first half of 1903 appears among the foundries, and considerable business has been closed or negotiated in the week with Northern furnaces. Southern producers as a rule are not quoting for next year. Ohio furnaces are selling for 1903 on the basis of $21 and $21.50 at furnace. The recent reports of purchases and negotiations by the United States Steel Corporation for Bessemer iron for the second quarter of next year are erroneous. No purchases have been made since that of two months ago for the six months ending with March, 1903. It is not expected that business for the second quarter of 1903 will be put through in the near future, as Valley furnacemen and the steel corporation are at variance on the matter of prices. The restraining influence of the consolidation is recognized throughout the market, yet the course of prices for plates and in the East for structural material shows that the tendency is to push up to the point at which restriction of consumption is sure to result. The tonnage of pig iron purchases under discussion by foundries for delivery next year, and at prices close to those prevailing recently for 1902 deliveries, indicates less opposition to this high level than might have been looked for. Foundries are making new contracts with their customers for the year beginning July 1, and are compelled to ask considerably higher prices than last year's, thus far without signs of reduced demand. While fear of the effect of high prices is felt throughout the trade—and the more as the period of sustained or of advancing prices lengthens—the check to demand for which all are looking does not yet appear. So far as pig iron is concerned, buyers seem to feel more interest in business for 1903 than producers show. Pig iron production, reduced at the beginning of the month by the Valley furnace strike, is now cut down by the West Virginia coke strike. Seven coke furnaces in the Hanging Rock District are banked but the embargo is not expected to last long. In Eastern Pennsylvania irregular fuel supply has increased the amount of low-grade iron made by the furnaces and reduced the supply for foundries, so that foreign metal still finds a ready market. From a weekly rate of 352,064 tons May 1 pig iron output was cut down by the blast furnace workers' strike to 344,748 June 1, but it is now close to the May rate, equivalent to 18,500,000 tons a year. Stocks fell off about 20,000 tons in May and are no longer a factor to reckon with. The finished material markets continue strong in the heavier lines—notably rails, plates and structural shapes—in all of which the mills will carry over tonnage into next year. The wire and wire nail mills are less fully employed, and a proposition for a partial shut-down in July is under consideration by the manufacturers. The sheet mills are less fully booked than the bar mills and the latter less fully than plate and structural mills. Lake shipyards have done some good buying for the new season's work, some 20,000 tons of plates and shapes being placed in the Cleveland and Chicago districts.

PITTSBURG.

OFFICE OF *The Iron Trade Review*,
429 PARK BUILDING, June 18.

The iron market has again reached a point where a restraining hand is needed in the interests of steadiness, and the large interests are seriously concerned about the situation. Base prices are quoted for late deliveries in all cases, and for early deliveries the United States Steel Corporation stays out of the market rather than quote advanced prices. Thus the corporation quoted 1.60c on plates, but cannot make any deliveries until late in the year, while other plate producers are quoting 1.85c to 2c on any nearby deliveries, and are taking on small quantities.

Official denial is made by the Bessemer Furnace Association that the United States Steel Corporation has bought or inquired for iron for delivery in the second quarter of next year, or any other delivery. The facts seem to be that the corporation had discussed the prices of iron for second quarter, and had received some offers, but that the high range of prices asked, $20 and even higher at furnace, influenced the corporation to put off buying for the present. No negotiations seem likely now for some time.

The condition in the wire trade is far from satisfactory. Prices are lower proportionately than of any other finished line; exports have been heavy and have increased steadily in the past two years when exports of other lines have decreased; many mills are shut down, including all but one or two of those running on purchased rods. Yet in spite of all this it is difficult to sustain the market. Negotiations have therefore been started to have a general shut down of all the mills for either two or three weeks, beginning July 1, the shut down of course to include the steel corporation plants. The probabilities seem to be that the plan will be made effective. This would relieve the wire situation, and the crude steel thus released would very advantageously be diverted into other finishing channels where the scarcity is pronounced.

The sheet trade is following in the footsteps of the wire trade, though in a much less marked degree. Quite a number of independent sheet mills are idle, and even a few of the sheet steel company's mills are reported closed. Deliveries are now being made very promptly and it is easy to buy in large lots at 3c for No. 28, while carloads can readily be had at 3.10c. It is evident that there are too many sheet mills, even for the present heavy consumption. The weakness in ordinary gauges of steel sheets is not shared by the heavy gauges, nor by puddled iron sheets, the latter being decidedly higher than a fortnight ago.

A meeting has been called of the independent sheet manufacturers' association for today (Wednesday) in Pittsburg. It is stated that no business of importance is to come up and a large attendance is therefore not probable. The last meeting was held in March, and since then several new mills have been started, which have signified their intention of being represented. W. F. Bonnell, of Cleveland, who went abroad on a steel purchasing mission, is expected to be present.

The market for iron bars has been strengthening steadily for the past two weeks, following the weakness which developed a month or so ago. The greatly decreased production in the East, due to the puddlers' and the anthracite miners' strike, is the main cause of the advance, which is helped by higher prices for gray forge and scrap, as many contracts are expiring for these raw materials. Iron skelp, especially sheared, is also very strong.

The best judges of the market here state that the outlook for good business for a year and probably two years,

is better today than at any previous time this year. This opinion is based on the present condition of order books and the favorable crop outlook.

PIG IRON.—Sales of all grades have been very light. An order for a round tonnage of any grade could scarcely be placed for this year's delivery with either Northern or Southern furnaces. All the Northern furnaces are behind in deliveries, averaging fully 30 days, and have little hope of catching up this year. The steel corporation has entirely dropped any thought of buying Bessemer for the second quarter of next year and is out of the market on all grades. We note a sale of about 1,000 tons of Bessemer at the equivalent of $21.50, delivered Pittsburg, for fourth quarter shipment. Gray forge has sold at t$21, which is the price for any delivery before the fourth quarter. The market is largely nominal, and we quote prices as follows, for this year's delivery, prices for next year being slightly lower:

Bessemer, Valley	$21 00 to 21 50
Bessemer, Pittsburg	21 75 to 22 25
No. 1 Foundry	22 50 to 23 25
No. 2 Foundry	22 25 to 22 75
No. 3 Foundry	21 25 to 21 75
Gray Forge, Pittsburg	20 50 to 21 00
Chilled Basic, Valley	20 25 to 21 00
Chilled Basic, Pittsburg	21 50 to 21 75

FERRO-MANGANESE.—There is practically no market on domestic ferro-manganese, as the only producers have reduced their output and are using all their own and considerable quantities of foreign as well. English ferro continues to be quoted at from $52 on large lots on contract, up to $55 on small lots for immediate shipment. Large quantities of English ferro continue to come over. The Germans, who have been unable to do much in this market, on account of their ferro running below 80 percent in manganese, and being otherwise irregular in quality, have been trying to enter the market and have been quoting $49 to make up for the poorer quality, but it cannot be learned that any important sales have been made. Some German spiegeleisen may, however, come in.

STEEL.—There is no market on domestic steel billets. The supply is very limited, and is held at $35 to $36, delivered Pittsburg, but finishing mills are both unwilling and unable to pay such figures, and it would take a price of $33 to $34 to sell any quantity. Sales of very small lots are reported at $36 and even a trifle better for Bessemer billets. The fixing of the rail price at only $28 for next year has had much to do with the unwillingness of buyers to pay current prices. A number of steel works are practically shut down, and others are getting out only a fraction of their output, through the scarcity of pig. Ashland has been shut down for a short time, and Wheeling has been running only about half. The German market seems to be weaker, as a lot of 2,000 tons of basic open-hearth 2x2 billets has been offered in this market at $32.25, delivered, or the same price as has been realized lately for the Bessemer product, which is not nearly as good.

RAILS AND TRACK MATERIAL.—The principal transaction in rails is a 60,000-ton order taken by the Lackawanna Steel Co., to be rolled at Buffalo. Very high prices are being paid for small lots of light rails, as well as splice bars and bolts, and rail seconds are selling at above $28 a ton. For forward delivery we repeat last week's quotations: Standard sections, 50 pounds and over, in lots of 200 tons and over, $28; car lots and less than 200 tons, $30; less than car lots, $32; light rails, 8 pounds, $45; 12 pounds, $42; 16 pounds, $39; 20 pounds, $37; 25 to 40 pounds, $34 to $36. Track material: Spikes, 2c to 2.05c; track bolts, square heads, 2.50c; hexagon heads, 2.65c; fish plates, 1.60c.

MUCK BAR.—Prices of muck bar are very stiff and the supply is extremely limited. We quote standard brands at $37, delivered Pittsburg, for any shipment within the next few months.

SKELP.—The supply of sheared skelp, both iron and steel, is extremely limited and the market can scarcely be quoted. We note a sale of sheared iron skelp at 2.40c, while sheared steel for any early delivery might bring 2.50c. Grooved skelp is a trifle easier. We note a sale of a round lot of grooved iron at 2.10c and quote the market on grooved steel skelp at 2.15c.

SPELTER.—Prices are very firm, owing to the strike of smelters which has seriously curtailed output, and prospects are that the market will go higher. We quote prime Western grades at 4.75c to 4.80c.

PLATES.—Plate prices for any nearby delivery are considerably higher. The United States Steel Corporation is still quoting on the old basis of 1.60c for tank, for any deliveries it can make, which would not be until late in the year. All the other mills are quoting 1.80c to 1.90c for any delivery within two or three months, and are not disposed to accept base prices even for late delivery. The demand has been quite heavy for small lots for early shipment. We quote the agreed prices, which have become almost entirely nominal except for next year, as follows: Tank plates, ¼-inch thick and up to 100 inches in width, 1.60c at mill, Pittsburg; flange and boiler steel, 1.70c; marine, ordinary firebox, A. B. M. A. specifications, 1.80c; still bottom steel, 1.80c; locomotive firebox, not less than 2.10c, and it ranges in price to 3c. Plates more than 100 inches wide, 5c extra 100 pounds. Plates 3-16 of an inch in thickness, $2 extra; gauges Nos. 7 and 8, $3 extra. These quotations are based on carload lots, with 5 cents extra a hundred pounds for less than carload lots. Terms, net cash, in 30 days.

BARS.—Iron bars are in excellent demand owing to decreased production in the East and heavier consumption. It is no longer possible to shade the regular price of 1.80c, Pittsburg, and orders can scarcely be placed even at this price. Steel bars are very firm and active in small lots. With the improved crop prospects it is expected that the agricultural implement interests will take very close to the maximum tonnages provided in the contracts made prior to April 1 for the season. These contracts contained minimum and maximum limits, to cover the conditions which good or bad crops might produce. Specifications against these contracts will therefore be considerably heavier than at first expected, but no additional buying is looked for unless very exceptional conditions should develop. For small lots for early delivery Bessemer steel bars bring 1.70c to 1.75c. We quote the market for forward delivery as follows: Bessemer steel bars, 1.60c; open-hearth, 1.70c; plow beams and cultivator beams, 1.60c, net; channels, angles, zees and tees, Bessemer under 3 inches, 1.70c; over 3 inches, 1.80c; bar iron, 1.80c to 1.90c, Pittsburg, with full freight added to point of delivery. Hoops and bands are quoted at 1.90c, full extras, in 250-ton lots and over, and 2c in less than 250-ton lots; refined iron bars, 2.25c and upwards.

PIPES AND TUBES.—All the mills are quite busy and are filled up for longer or shorter periods on the different varieties. Some of the independent pipe mills have advanced prices 5 percent, but we continue to quote discounts of the leading producer as follows to jobbers in carload lots, Pittsburg, with freight to destination added according to the pipe book:

MERCHANT PIPE.

	Black. Per cent.	Galv. Per cent
⅛ to ¼ and 11 to 12 inches	60	48
⅜ to 12 inches	67	55

Discounts to consumers in carload lots, Pittsburg, are as follows:

BOILER TUBES.

Steel.

	Per cent.
1 to 1½ inches	42½
2¼ to 5 inches	61
1¾ to 2¼ and 6 to 13 inches	55½

Iron.

	Per cent.
1 to 1½ inches	39
2¼ to 5 inches	48
1¾ to 2¼ and 6 to 13 inches	38

CASING.

	S. and S. Per cent.
2 to 3 inches	58
3¼ to 4 inches	60
4½ to 12½ inches	63

SHEETS.—Demand for the ordinary gauges of steel sheets is quite limited. A number of the independent mills are closed and a few of the combination's union mills are reported closed in the last week. Deliveries all around are entirely satisfactory as compared with the condition early in the year. Jobbers are well supplied and can make quick shipment of most sizes from stock. The demand for the heavy gauges continues very good. Puddled iron sheets have advanced in the past two weeks, owing to heavy demand for corrugated iron sheets for

covering buildings. In large lots there is no difficulty in placing contracts at 3c for No. 28, although some mills are quoting 3.10c. We quote the market as follows in carload lots: Nos. 10 and 12, 2.40c to 2.50c; 14 and 15, 2.50c to 2.60c; 16, 2.60c; 18 and 20, 2.70c to 2.80c; 22 and 24, 2.80c to 2.90c; 26, 2.90c to 3c; 27, 3c to 3.10c; 28, 3.10c to 3.20c; 29, 3.25c to 3.35c; 30, 3.35c to 3.45c. Galvanized sheets, in carload lots to consumers, are quoted at 3.05c for Nos. 10 and 11, 3.45c for Nos. 18 to 21, 4.20c for No. 27, and 4.50c for No. 28. Galvanized sheets, mill shipments in carload lots to consumers are as follows: Nos. 10 and 11, 3.05c; Nos. 12 to 14, 3.15c; Nos. 15 to 17, 3.25c; Nos. 18 to 21, 3.45c; Nos. 22 to 24, 3.75c; Nos. 25 and 26, 4c; No. 27, 4.25c; No. 28, 4.50c.

Structural Material.—While there has been considerable business booked for next year, the aggregate tonnage is not very large, since the mills are taking no orders except for material to go on definite building projects. No season or other indefinite contracts are being made. Small lots for quick shipment are being sold by dealers at 2.75c to 3.25c. We quote regular prices, which can be done only on late deliveries, as follows: Beams and channels, 3 to 15 inches, 1.60c; 18 to 24 inches, 1.70c; tees, 1.65c; zees, 1.60c; angles from 3 to 6 inches, 1.60c; universal mill plates, 1.60c.

Wire and Wire Nails.—Conditions in the wire and wire nail trade are not very satisfactory, as there is evidently too much productive capacity. An arrangement is being formulated, with probable success, for a shut down of all the wire mills in the country to begin July 1 and continue for two or three weeks. Prices on cut nails are quite firm, and apply mainly to steel cut nails, as iron cut nails are scarcely to be had. We repeat quotations: Wire nails in carload lots, $2.05 per keg; smaller lots, $2.10 and $2.15; plain wire, $2 in carload lots and $2.10 in less than carload lots to retailers; galvanized wire, $2.40 in carload lots; polished staples, $2.20, and galvanized staples, $2.60; painted barb wire, $2.60, and galvanized, $2.90. These prices are quoted on a Pittsburg base, plus the actual freight to destination. Cut nails are held at $2.05 in carload lots and $2.10 in less than carload lots, Pittsburg, plus freight to destination.

Merchant Steel.—There is a good strong demand for shafting and the market is now in much more satisfactory shape than it was two or three months ago. Prices are very firm on merchant steel. Quotations are unchanged as follows: Turned, cold rolled ground shafting in carload lots is quoted 50 off, and in less than carload lots, 45 off; tire steel, 1.80c in carload lots and 2c less than carload lots; toe calk, 2.10c to 2.25c; sleigh shoes, 2.10c to 2.25c; machinery steel, 1.70c; smooth machinery steel, 1.75c. Tool steel, 7 cents and upwards.

Old Material.—The supply of scrap is scarcely as short as some dealers profess to believe. Prices on sheet scrap are purely fictitious, being $19 to $19.50, but the material is in strong hands. Ordinary heavy melting stock is held at $21, but crop ends of known quality might bring as high as $22. A large basic open-hearth plant which will not turn out any steel for a couple of months or more has already accumulated a large quantity of scrap in its yard. We quote No. 1 wrought scrap in net tons at $22 and other grades as follows in gross tons: Car wheels, $21 to $21.50; steel rails, mixed lengths, $21; rerolling lengths, $22.50 to $23; relaying rails, $27 to $29 and $30; old iron rails, $27; No. 1 cast scrap, $18.50 to $18.75; wrought turning, $13.50 to $14.

Coke.—Coke production in the Connellsville region last week broke all previous records, being 250,384 tons. The increase was owing in only a slight degree to the anthracite and West Virginia strikes. Production in the Lower Connellsville region amounted to 35,115 tons. There are conflicting reports at this writing about the state of the strikes in different West Virginia fields, but production of coke has been seriously curtailed, and the furnaces in Southern Ohio districts, which depend on West Virginia coke, are hard put and are not getting out their maximum production. If the strikes continue some will have to blow out. Reports are that the Chicago district is also affected. Owing to these labor troubles prices of spot coke have advanced sharply in the past week or ten days, and standard Connellsville furnace coke for spot shipment is now held at $2.75 for western shipment and $3.00 for eastern shipment, the supply of cars for eastern shipment being very limited and accounting for the higher price. Furnace coke on contract remains at $2.25 for standard Connellsville and about 25 cents lower for main-line coke.

CHICAGO.

OFFICE OF *The Iron Trade Review*,
519 Monadnock Block, June 17.

With the exception of one or two lines, there is very little of the usual midsummer dullness apparent in this market at present, and specifications from consumers are as heavy as at any time in the past six months. Many concerns are usually busy about this time of the year taking inventory of stock and manufacturers have heretofore always taken advantage of the opportunity to shut down their mills and make needed repairs. There is, however, no slackening in the demand for material, and while some plants will have to be shut down, most of them will be compelled by the large volume of business on the firm's books, to keep in operation all summer. Buying of material for delivery next year grows larger each week. Orders for over 300,000 tons of rails, 50,000 tons of structural steel, and several thousand tons of pig iron have already been placed. There has also been some small buying of other materials for shipment next year, but this tonnage is not of very great proportions. While consumers are fairly safe in buying finished material for delivery in 1903, inasmuch as the price for this period has been fixed on some products, opinion is divided among local pig iron sellers as to the advisability of foundrymen buying for the same period. Some believe the market will go higher before the usual time for buying for next year's needs arrives; others that it will go lower. Northern iron for shipment next year, however, is being held firmly at present quotations, though the price of Southern iron for the same delivery is not so uniform. Some furnaces are asking $17 Birmingham for No. 2, some $17.50, and others $18. Bar iron still continues to be the only weak feature of this market, and there is considerable competition among mills for the business that is being offered. There is little buying of scrap, and prices are not being so firmly maintained, which in turn may have some effect on the price of bar iron.

Pig Iron.—Iron of any kind for shipment in the next four months is extremely scarce, and so tightly are the furnaces sold up that the only possibility of any spot iron being offered in this market is when the tonnage of a day exceeds the scheduled deliveries on the company's books for that day. Occasionally this happens, and when it does the iron is carefully doled out, small foundries being given the preference. There is no Northern iron offerd for spot shipment; all prompt iron comes from the South, and $19 Birmingham is now being asked. A local furnace company has still some iron to offer for delivery in the last two months of the year, but not much. Buying for next year's delivery is of a vacillating nature, and though the inquiry is large, the contracts placed are few. The present high prices and the unanimity among sellers as to the advisability of selling for shipment next year are not conducive to heavy buying. The principal Southern producers are not offering anything for 1903, and the Southern product that is now in the market is from the smaller furnaces. These are quoting $17 to $18 for No. 2 foundry, Birmingham. Northern iron for next year's delivery is being held firmly at present quotations. We quote as follows:

Lake Sup. Charcoal	$23 50 to $24 00	Southern Coke No. 4	$19 65 to $20 15
Local Coke Fdy. No. 1	22 00 to 22 50	Southern No. 1 Soft	21 15 to 21 65
Local Coke Fdy. No 2	21 00 to 21 50	Southern No. 2 Soft	20 15 to 20 65
Local Coke Fdy. No. 3	20 00 to 20 50	Southern Gray Forge	19 65 to 20 15
Local Scotch Fdy. No. 1	22 00 to 21 50	Southern Silveries	21 15 to 21 65
Local Scotch Fdy. No. 2	20 50 to 21 00	Jackson Co. Silveries	23 50 to 24 50
Southern Coke No. 1	21 15 to 21 65	Ohio Strong Softeners	24 10 to 24 60
Southern Coke No. 2	20 65 to 21 65	Alabama Car Wheel	23 65 to 24 10
Southern Coke No. 3	20 15 to 20 65	Malleable Bessemer	22 00 to 22 55

Bars.—The most hopeful feature in this market is the heavy specifications coming in from all classes of consumers. There is also quite a large amount of new business being offered each day, to secure which there is considerable competition among the mills. None of the manufacturers are maintaining the price of 1.95c on bar iron and we hear of another large order being taken at 1.75c. We

quote Chicago delivery, Bessemer steel, 1.75c to 1.85c; angles, less than 3x3, 1.85c; iron, 1.75c to 1.85c; hoops, 2.15c. Prices out of store: steel, 2c to 2.10c; iron, 2.15c to 2.25c; hoops, 2.40c to 2.45c; angles, 2.50c to 2.60c.

SHEETS.—There is an active demand for both black and galvanized sheets of all gauges. We quote No. 27 black, mill shipments, Chicago delivery, 3.15c to 3.25c; galvanized, 4.40c to 4.50c; out of store, No. 27 black, 3.45c to 3.55c; galvanized, 4.70c to 4.80c.

STRUCTURAL MATERIAL.—Inability to get steel this year has caused many building enterprises to be postponed until 1903. Contracts calling for delivery of material next year, already placed through local offices exceed a total of 50,000 tons, with a number of large inquiries still pending. The only material to be had in this city for prompt shipment is from warehouse stocks. We quote mill prices, as follows: Beams, 15 inches and under, 1.75c; 18 inches and over, 1.85c; structural angles, 3x3 to 6x6, 1.85c; angles, channels and tees, smaller than 3 inches, 1.85c base; plates, 1.75c. Prices on lots from store are based on the necessities of buyers and according to the size of order. Store prices vary from 2½ to 4 cents a pound.

BILLETS.—We note a sale of 2,000 tons of domestic open-hearth billets in this market last week. There is plenty of inquiry, but little material is being offered. We quote Bessemer billets, $36 to $38; open-hearth, $38 to $40.

RAILS AND TRACK SUPPLIES.—Heavy sales of rails have been made in the last week, and the total tonnage now on the local company's books for next year's delivery is about 300,000 tons. There has been a good business done also in track supplies for next year's shipment. Light rails are in active demand, and are bought as quickly as they are offered. We quote standard rails, $28; second quality, $27; light rails, 45 pounds, $34 to $35; 12 pounds, $40 to $41 with regular differentials for intermediate sizes; out of store, $45 to $50; splice bars, 2.25c; spikes, carload lots, 2.45c to 2.55c; track bolts 3½x3¼, with square nuts, 2.85c per 100 pounds; with hexagon nuts, $3, with usual differentials for other sizes.

MERCHANT STEEL.—Manufacturers report that specifications on contracts already taken are so heavy that they are not seeking new business. They will be out of the market from two to three months. We quote mill shipments, Chicago delivery, as follows: Smooth finished tire steel, 1.95c to 2c; open-hearth spring steel, 2.65c to 2.75c; sleigh shoe, 1.75c to 1.80c, flat sizes; concave and convex, 2c; out of store, 2.15c; cutter shoe, 2.40c to 2.60c; machinery steel, 2.15c to 2.25c, base; plow steel, 2.50c and upwards, according to quality; toe calk, 2.25c to 2.35c; out of stock, 3c to 3.10c; ordinary tool steel, 6c to 7c; specials, 13c and upwards; less than carload lots, 5 percent to 10 percent higher, cold rolled shafting, carload lots, 50 percent off, Chicago; less than carload lots, 45 percent off, Chicago, b. Chicago; 6-inch water pipe and larger sizes, $32; gas pipe $1 a ton higher.

CAST IRON PIPE.—The market is devoid of interest. Orders for small lots are fairly plentiful, aggregating a good tonnage. We quote 4-inch water pipe, $34 carload lots f. o.

MERCHANT PIPE.—There has been a brisk demand for pipe in the past week for all sizes. Jobbers of boiler tubes report a good current business. We quote as follows:

MERCHANT PIPE, RANDOM LENGTHS.

	Black Per cent.	Galv. Per cent.
⅛ to ⅜ in.	56½	44½
¼ to 12 in.	63½	51½

BOILER TUBES.

Steel.

	Per cent.
to 1¼ in.	35
1¼ to 2½ in.	45
1¾ to 5 in.	55
6 to 13 in.	47½

Iron.

	Per cent
1¼ in.	35
1¼ to 2¼ in.	32½
2½ in.	35
2¾ to 5 in.	42½

PLATES.—Mills report that specifications are very heavy. Jobbers are also experiencing an active demand for all sizes, the orders coming in from all parts of the country. We quote mill prices, Chicago delivery: Tank steel, ¼-inch and heavier, 1.75c to 2.15c; flange steel, ¼-inch and heavier, 1.85c to 2.25c; from stock, tank steel, ¼-inch and heavier, 2.20c to 2.35c; 3-16, 2.30c to 2.45c; No. 8, 2.35c to 2.55c; flange steel, 2.35c to 2.50c.

WIRE AND WIRE NAILS.—As has always been the case at this season in past years, new business has fallen off some in the last two weeks. This is the time when dealers in the country take inventory of their stock, and the quietness was not unexpected. The local interest reports that it contemplates shutting down some of its plants for repairs during July. We quote as follows: Smooth wire carloads, $2.15; painted barb wire, $2.75; galvanized barb wire in carload lots, $3.05; wire nails, carload lots, $2.20; staples, carload lots, $2.30; jobbers' prices to retailers, 5 cents higher than above for carload lots, and 10 cents higher for less than carload lots.

COKE.—Foundrymen and others continue to buy rather heavily of coke in view of the continuance of the strike among the coal miners, and there is a scarcity of material. We quote 72-hour Connellsville foundry, $5.50; for spot delivery, $5.75; Virginia and West Virginia coke, $5.25 to $5.50.

OLD MATERIAL.—Though there is as yet no cutting of prices, the general tone of the market is weaker. Mills are buying very little material in view of the near approach of the time when many shut down for repairs, and, consequently, dealers are getting stocked up. We quote gross tons as follows:

Old iron rails	$24 00 to $25 00	Relaying rails	31 00 to 32 00
Old steel rails, long lengths	22 50 to 23 00	Old wheels	19 50 to 20 00
Old steel rails, short lengths	17 00 to 18 00	Heavy melting steel	18 00 to 19 00
		Mixed country steel	13 50 to 14 00

The following are selling prices per net ton:

No. 1 R. R. wrought	$19 50 to $20 00	Steel axles	$19 00 to $19 50
No. 2 R. R. wrought	18 00 to 18 50	Cast borings	9 00 to 9 50
Dealers' forge	15 50 to 16 00	Wrought turnings	13 00 to 13 50
No. 1 busheling	13 50 to 14 00	Iron axle turnings	14 00 to 14 50
No 1 R.R. & mch. cast	14 25 to 14 75	Steel axle turnings	13 50 to 14 00
Railway Malleable	15 00 to 15 50	Stove plates	11 00 to 11 50
Country malleable	13 00 to 14 00	Old iron splice bars	21 00 to 21 50
Iron axles	24 50 to 25 00		

CLEVELAND.

OFFICE OF *The Iron Trade Review*,
1064 ROSE BUILDING, June 18.

PIG IRON.—Inquiry in pig iron has been greater in the past week than for some time, and much of it is for delivery in the first half of 1903. A number of lots of foundry iron of 500 and 1,000 tons are under negotiation and will likely be closed in the coming week. Prices are on the basis of $21 to $21.50 for No. 2 foundry iron at Valley furnace, or substantially the same as for delivery in the second half of this year. Southern furnaces, like those in Ohio and Western Pennsylvania, have little iron to offer for this year. It is probable, in view of the interruptions to furnace operations in various quarters, that a round tonnage of iron engaged for this year will not be delivered until after Jan. 1. The banking of Southern Ohio furnaces because of the West Virginia coal strike is cutting short the supply of a number of foundries in this district. The question whether foundrymen would be willing to pay for forward delivery approximately the prices that have been the basis of the transactions of the past month is beginning to be answered in the affirmative. It is granted by both sides of the market that this level is a high one on which to make contracts that do not terminate for 12 months, but this seems to be just what the trade is going into. Foundrymen necessarily are asking higher prices for castings and thus far have not found that business is being checked. There is practically nothing doing in Bessemer iron. Some small sales have been made at $21 to $21.50 in the Valley. Forge iron brings $21 Pittsburg, or $20.25 at Valley furnace, and continues very scarce. We quote the pig iron market as follows:

Bessemer	$21 75 to $22 25	Scotch No. 1	$21 75 to $22 75
No. 1 Strong F'dry	21 75 to 22 25	Scotch No. 2	21 75 to 22 25
No. 2 Strong F'dry	21 75 to 22 75	Gray forge, Valley	19 75 to 20 25
No. 3 Foundry	19 75 to 20 25	LakeSuperior charc'l	22 00 to 23 00

FINISHED MATERIAL.—Contracts on behalf of shipyards have been the feature of the past week. For the American Shipbuilding Co., in part to provide for vessels already under contract for the coming season, about 19,000 tons of plates and shapes have been purchased in the past 10 days. Independent shipyards have also been in the market for deliveries after the

first of the coming year. Boiler manufacturers have been buying plates in the week, some contracts being made running to July 1, 1903. These are on the basis of 1.60c for tank steel, Pittsburg. Manufacturers outside of the steel corporation have been getting from $2 to $3 a ton above this price or 1.80c to 1.85c, Cleveland. Structural buying for next year continues to be a factor. The large volume of specifications against contracts is a matters of comment in nearly all lines, and many buyers are waking up to the fact that they have taken all the material to which they are entitled, and must buy more. The more active season in sheets is on and the movement is now more in line with what is expected at this time of the year. The supply of heavier gauges does not show any betterment. We continue to quote 2.10c, Cleveland, for 3-16-inch and heavier and 2.25c, Cleveland, for No. 8. We quote Cleveland prices as follows on mill sales of black sheets: No. 24, 2.90c to 3c; No. 26, 3c to 3.10c; No. 27, 3.10c to 3.20c; and the following prices out of stock: No. 10, 2.35c to 2.50c; No. 12, 2.45c to 2.60c; No. 14, 2.55c to 2.70c; No. 16, 2.95c to 3c; No. 18, 3c to 3.15c; No. 20, 3.05c to 3.20c; Nos. 22-24, 3.15c to 3.30c; Nos. 22-26, 3.25c to 3.40c; No. 27, 3.35c to 3.50c; No. 28, 3.45c to 3.60c, for one pass cold rolled. For full cold rolled .10c extra is charged. On galvanized sheets Cleveland prices to consumers are as follows for carload lots: Nos. 10 and 11, 3.15c; Nos. 12 to 14, 3.25c; Nos. 18 to 21, 3.55c; Nos. 22 to 24, 3.85c; No. 27, 4.35c; No. 28, 4.60c. Premiums are being paid for deliveries of steel bars in the near future, and this is true also of bar iron. On the latter the principal producer is sold from two to three months ahead and the basis of 1.80c, Pittsburg, is being maintained in this market. The two local rolling mills will shut down for repairs early in July but the period of idleness will be as short as possible. There is no change in the basis on bars out of store—1.90c to 2c, Cleveland.

Old Material.—The market is firmer in some lines, but with no heavy buying. Mills are taking material sparingly at the present prices. We quote the Cleveland market, all gross tons as follows:

Old iron rails	$ 26 00 to 27 00
Old steel rails (6 ft. and over)	22 00 to 23 00
Old steel rails (6 ft. and under)	19 00 to 20 00
Old car wheels	18 00 to 19 50
No. 1 R. R. wrought scrap	21 50 to 22 00
Mill scrap	18 50 to 19 00
No. 1 machine cast scrap	17 00 to 18 00
Iron axles	28 00 to 29 00
Axle turnings	17 00 to 17 50
Wrought turnings (free from cast)	14 00 to 14 50
Cast borings	9 50 to 10 50
Uncut wrought iron boilers	11 00 to 12 00
Steel boiler plates	16 00 to 17 00
Grate bars	11 50 to 12 50
Pipes and flues (clean)	17 00 to 18 00
Tank iron	17 00 to 18 00
Hoop and band iron	13 50 to 14 50
Sheet iron	11 50 to 12 00
Wrought drillings	13 00 to 13 50
Malleable iron	17 00 to 18 00
Stove plate	13 00 to 14 00
Heavy steel	18 50 to 19 50

CINCINNATI.

June 18.

The siuation in the pig iron market caused by the striking coal miners is more acute than it was last week. This is especially true of the furnaces in the Hanging Rock District, though it cannot be said to hold in the South. In the Hanging Rock District the Hamilton furnace is out of blast because of lack of coke; the Belfont will go out of blast for a period of four to six weeks for repairs; the Kelly has been out of blast for some time for repairs, but now that it is able to start up by being in good repair it cannot be blown in again because it cannot get the coke; the Wellston was banked last week; and finally the Marting is running according to last accounts but may have to close down any time. A telegram from the Pocohontas district to prominent iron factors here states that there may be shipments of coke out of there this week. It is also reported here that men are going back to work along the Norfolk & Western, and this will materially affect the strike situation.

General trade is very good and as yet the strike and the possibility of higher priced iron have not affected the market for finished material or scrap. Machine tool men report a very good domestic business and also intimate that they may be compelled to advance prices. All manufacturing lines are having a good trade and on the prospects of good crops the clothing, boot and shoe, dry goods and similar lines report that they are having a much heavier demand for goods for fall shipment than they had for last fall, to say nothing of last spring's business.

Pig Iron.—There has been a fair run of business among the pig iron dealers in spite of the uncertainty of the situation. Most of the buying has been in small amounts and for as quick shipment as possible. The inquiry is not for one kind of iron more than another but is well distributed. There is practically no car wheel iron offering for shipment this year. Foundry iron is being purchased to fill up the gaps and to take the place of some other grades that cannot be procured. The price for Southern No. 2 Foundry remains at $18 Birmingham. On the whole the market is quiet and rather featureless, but it is expected that a few of the Southern furnaces will have a little more iron to offer next month. So far there has been but little business done calling for delivery into next year, but it is stated that the consumers will push matters to the point that they will be able to secure contracts for delivery four or five months ahead and that before very long. It is well understood that the Southern furnaces will all be in the market again Sept. 1. Prices for pig iron at Cincinnati are quotable as follows:

Southern Fdy. No. 1			$20 75 to 21 75	Gray Forge	$19 00 to 20 00
"	"	2	20 25 to 21 25	Northern Fdy. No. 1	23 60 to 24 10
"	"	3	19 75 to 20 75	" " 2	23 10 to 23 60
"	"	4	19 25 to 20 25	Southern C. W. iron	25 25 to 25 75
So. Fdy. No. 1 soft			20 75 to 21 75	Malleable coke iron	22 75 to 23 50
So. Fdy. No. 2 soft			19 75 to 20 75		

Finished Material.—The market for all kinds of finished material, while not as yet directly affected by the strike troubles and the possibility of a greater scarcity of pig iron, is nevertheless rather halting. The demand for structural material is heavier than ever. Bar iron and steel is being taken by consumers in a way that indicates the tremendous activity of all branches of business that utilize these products. There is nothing unusual or remarkable about the market and prices remain unchanged—bar iron at 1.92c and bar steel at 1.72c, both iron and steel bars being quoted at 2.20c out of store. Angles are 2.35c and 2.50c out of store. Sheets are quoted at 2.50c for No. 12 and 2.35c for No. 10.

Old Material.—It might be expected that market for scrap would begin to show some indication of an advance in line with the strengthening tendency in pig iron. Such is not the case, however, and there is no noticeable tendency to advance although the demand is moderately good. The following quotations are still good:

Old No 1. Wrought Railroad, net tons	$ 19 50 to 20 00
Cast Machine and Foundry, net tons	14 00 to 14 25
Old Iron Rails, gross tons	25 00
Old Steel Rails, gross tons	24 50 to 24 75
Old Short Lengths, gross tons	17 50 to 18 00
Old Iron Axles, gross tons	25 00
Old Iron Car Wheels, gross tons	19 00 to 19 50
Stove Plates, gross tons	11 00 to 11 25
Wrought Turnings, net tons	14 00
Cast Borings, net tons	8 50 to 8 75

The Wireton Heating Co., whose plant at Blue Island, Chicago, was destroyed early in the year, will locate at Chicago Heights, Ill. There will be a foundry, machine, and tin shop, boiler and engine house, and warehouse, the latter covering 100x200 feet of ground. All the buildings will be of brick and stone and mill construction, and the total cost of the plant is estimated at $125,000.

James M. Carter & Co. have the contract for constructing a boiler house and setting boilers for the Lucas Machine Co., Glenville, O.

Corrigan, McKinney & Co. have decided to close their Duluth office and transfer all work heretofore done in Duluth to Cleveland, where the main offices are located. Amos Shepard will hereafter be superintendent of the company's mines on the Mesabi range, with headquarters at Hibbing. George Wallace, superintendent of the Crystal Falls, Mich., district, has resigned to go into business for himself. His successor has not been appointed.

The P. A. Clum Co., brass founder, has bought land at Rochester, N. Y., and will immediately erect a building, 100x329 feet and of brick and wood, the wood sheathed with metal in the foundry proper. The foundry will be 100x150 feet.

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JUNE 19, 1902.

The American Foundrymen's Association.

(Special Telegram.)

BOSTON, June 17.—With an attendance of nearly 200 of its members the seventh annual convention of the American Foundrymen's Association began its sessions here this morning in Huntington Hall of the Massachusetts Institute of Technology. All sections of the country sent representatives, while a good sized delegation is present from Canada. The prospects for a highly instructive convention are extremely bright judging from the number of papers on the program, while entertainment features have been given unusual attention by the Boston association. Owing to the recent death of the association's president, John G. Sadlier, the meeting was called to order this morning by Secretary Moldenke. After a few remarks the secretary introduced Walter F. Prince, vice president of the New York and New Jersey District, who had been selected to act as chairman of the convention sesstons. Mr. Prince introduced H. A. Carpenter, president of the New England Foundrymen's Association, who extended the visiting foundrymen a hearty welcome on behalf of the organization which he represented. The freedom of the city was given the visitors by Jas. H. Doyle, chairman of the board of aldermen of the city of Boston, representing Mayor Collins, who was unable to be present. The use of Huntington Hall was tendered the association by Prof. C. F. Park on behalf of the Massachusetts Institute of Technology. All these hearty greetings were responded to by C. S. Bell, of Hillsboro, O., on behalf of the association, who spoke in his own happy vein.

The report of the secretary, reviewing the work of the year, and that of the treasurer and auditing committee were presented and accepted with votes of thanks. The treasurer, Thos. D. West, reported a balance of $68.31 on hand at the beginning of the year, and cash remittances from the secretary of $2,285.67, making a total of $2,353.98. The expenditures were $40.13 for sundries, $900 for salaries, $105.85 for printing, $958.30 for the *Journal*, $250.50 for postage and $97.83 for the Standardizing Bureau, making a total of $2,352.61. The balance in the treasury is $1.37.

Thos. D. West presented the report of the association's Standardizing Bureau and a vote of thanks was extended the committee for the good work of the bureau. It will of course be continued.

The committee on standardizing methods of determining the constituents of cast iron reported progress. A large number of letters have been sent out to chemists, testing engineers and others connected with the foundry industry, requesting memoranda upon their methods, with a view to selecting standards therefrom. These reports are to be published in the *Journal*, with names omitted, and properly grouped for study by the experts who will be asked to select methods best adapted to foundry requirements. In the meantime the committee solicits further communications from active iron chemists.

Report on Standard Methods of Sampling Pig Iron.

Reports on standard methods of sampling pig iron and specifications therefor and the grading of pig iron by analysis were also presented. The committees making the first two reports were continued while the third committee was discharged at its own request. The report on standard methods of sampling pig iron is signed by Thos. D. West, chairman, Richard Moldenke, James Scott, P. W. Gates and E. H. Putnam and is as follows:

In conformity with the instructions received at the last convention, your committee begs to make its report on a standard method of sampling pig iron for foundry purposes. In his memorial to the association, urging standard methods of sampling, Mr. A. L. Colby emphasized the necessity of this action in order to avoid unnecessary complications between furnacemen and founder. Your committee, after studying the matter, has come to the conclusion that inasmuch as the furnaceman has the burden of the trouble to bear in case of rejections, it is in his interest to see that the various car loads of iron he sells are sampled by the purchaser in the fairest manner possible. Your committee did not think it wise to specify the manner in which a furnaceman should sample his casts, interesting as it may be; for we are solely concerned with the particular car load which comes to us, and have no means of knowing how many furnace casts may be mixed in it accidentally or otherwise. We further recommend that the method to follow be adopted provisionally only, in order to give the furnaces an opportunity to give us the benefit of their experiences during the coming year. Your committee can then report finally.

The specifications accompanying the report are as follows:

1. Eight pigs shall be selected from each car load of iron, two each from the upper and the lower portion of each half of the car. The eight pigs, being of the average size and weight of the shipment, will be fairly representative of the whole.

2. These pigs are broken in such a way that a piece of convenient length showing a clean fracture is available. The eight pieces are placed in a suitable box, and this duly marked with the car initial and number.

3. The freshly fractured and clean face of each piece is now drilled in two places half way between the centre and edge, a drill of large diameter being used. From the heap of drillings surrounding the drill enough is taken for the purpose wanted, and placed on a sheet of glazed paper, the drillings are thoroughly mixed and preserved. In case of dirty or excessively sandy iron the magnet should be used on the sample before analysis, for additional safety.

4. Sufficient drillings shall be made to afford material for exchange with the furnace laboratory, as well as with a possible subsequent checking with the American Foundrymen's Association standards.

5. The allowable variation from specified compositions shall be as follows: For silicon, 10 points either way (plus or minus 0.10 percent). For sulphur not over 0.005 percent above the determinations, in case of a dispute, to be made by the oxidation method. For manganese, 10 points either way. For phosphorus, not over .05 percent above for all irons running over .30 percent. Below this the variation shall be a matter of special agreement. For total carbon, if specified at all, the variation shall be a matter of special agreement.

6. The variation of the check determinations between foundry and furnace, as well as with the American Foundrymen's Association standards, shall not be over the following: Silicon, .05 percent; manganese, .05 percent; sulphur, .005 percent; phosphorus, .02 percent, and total carbon, .05 percent.

The report of the committee on the foundry trade school elicited much discussion and it was decided to appoint a committee of the American Foundrymen's Association to act in conjunction with Pittsburg Foundrymen's Association in order to secure a foundry department in the Carnegie Technical Institute for which $7,000,000 has been donated and which will be erected in Pittsburg.

Frederick Conlin, of South Bethlehem, Pa., read an interesting paper on the insuring of patterns, and it was decided to appoint a committee of three to formulate rules governing the insurance of patterns and report at the next convention. The committee was further authorized to con-

fer with the proper insurance authorities with a view to securing an adjustment of the various questions relating to pattern insurance.

The reading of the paper on reducing the apprenticeship period by E. H. Putnam was deferred and the meeting adjourned. This being Bunker Hill day many amusements were offered the visitors during the afternoon and in the evening all were in attendance at one of the local theaters.

Those in Attendance.

The early enrollment of members and guests includes the following names:

Dr. Richard Moldenke, secretary, New York.
F. F. Stockwell, H. R. Luther, W. L. Ducey, W. H. Herne, Barbour-Stockwell Co., Cambridge, Mass.
A. W. Walker, Walker & Pratt Mfg. Co., Boston.
J. P. Winlock, Barbour-Stockwell Co., Cambridge.
J. F. Mills, Abendroth Bros., Port Chester, N. J.
J. W. Burr, Burr & Houston Co., Brooklyn.
John Magee, Magee Furnace Co., Boston.
Chas. T. Colvin, Colvin Foundry Co., Providence, R. I.
L. S. Brown, Springfield Facing Co., Springfield, Mass.
Geo. H. Gibby, Condor Iron Foundry, East Boston, Mass.
G. H. Lincoln, Geo. H. Lincoln & Co., Boston.
A. W. Gibby, Mechanics Iron Foundry Co., Boston.
David Reid, Saco & Petter Machine Shops, Biddeford, Me.
L. W. Perrault, Jenckes Machine Co., Sherbrooke, Que.
T. J. Best, Warden, King & Son, Ltd., Montreal.
R. S. MacPherran, Allis-Chalmers Co., Milwaukee.
C. J. Wolff, C. L. Wolff Mfg. Co., Chicago.
Alfred Rossow, C. L. Wolff Mfg. Co., Chicago.
J. D. Smith, J. D. Smith Foundry Supply Co., Cleveland.
Hugh McPhee, Eaton, Cole & Burham, Bridgeport, Conn.
A. M. London, Eaton, Cole & Burnham, New York.
Lewis McPhee, Eaton, Cole & Burnham, Bridgeport.
B. M. Shaw, Walker & Pratt Mfg. Co., Watertown, Mass.
Geo. S. Bullock, Whitehead Bros. Co., Providence, R. I.
T. E. Inslee, Walker & Pratt Mfg. Co., Watertown, Mass.
Robert Blythe, Walker & Pratt Mfg. Co., Watertown, Mass.
H. L. Prince, General Electric Co., Schenectady, N. Y.
J. W. Bush, Pratt & Cady Co., Hartford, Conn.
J. W. Winchester, Magee Furnace Co., Chelsea, Mass.
J. W. Conway, Hartford Foundry Co., Hartford, Conn.
O. C. Beck, Colorado Iron Works, Denver, Col.
T. H. Calvin, Calvin Foundry Co., Providence.
Frederick Conlin, Bethlehem Foundry & Machine Co., Bethlehem, Pa.
Paul R. Ramp, American Locomotive Works, Schenectady.
W. H. Namack, American Locomotive Works, Schenectady.
S. T. Johnston, S. Obermayer Co., Chicago.
F. M. Etting, E. J. Etting, Philadelphia.
J. P. Goulden, Goulden Foundry & Machine Co., Columbus, Ga.
E. A. Pridmore, H. A. Pridmore and D. F. Egan, Pridmore Molding Machine Co., Chicago.
J. Gilmour, Northern Engineering Works, New York.
J. Frank Dye and E. W. Van Dye, Newport Sand Bank Co., Newport, Ky.
L. M. Fenner, New York Air Brake Co., Watertown, N. Y.
John D. Ormod, Donaldson Iron Co., Emans, Pa.
A. W. Link, Erie Foundry Co., Erie, Pa.
Charles Thomas, Syracuse, N. Y.
J. L. Anthony, Weir Stove Co., Taunton, Mass.
J. W. Dopp, Tabor Mfg. Co., Philadelphia.
W. H. Bense, Kinsley Iron & Machine Co., Canton, Mass.
D. L. Kent and W. L. Welch, E. L. Kent, Boston.
A. O. Backert, *The Iron Trade Review*, Pittsburg.
F. B. Foster, Geo. H. Lincoln, Boston.
D. C. Warren, *The Iron Trade Review*, New York.
F. A. Fisher, Enterprise Foundry Co., Sackville, N. B., Can.
Henry Hansen, *The Foundry*, Cleveland, O.
W. F. Prince, International Steam Pump Co., Elizabeth, N. J.
Geo. A. Drysdale, Howard & Bullough, Pawtucket, R. I.
W. Bylum, Birmingham Iron Foundry, Derby, Conn.
Geo. W. Cope, *Iron Age*, New York.
C. A. Reed, U. S. Bartlett & Co., Boston, Mass.
H. W. Johnson, Pratt & Whitney Co., Hartford, Conn.
C. C. Boyden, Matthew Addy & Co., New York.
E. H. Mumford, Tabor Mfg. Co., Philadelphia, Pa.
C. D. Palmeter and F. J. Giles, Watertown Engine Co., Watertown, N. Y.
W. E. Farrell, Diamond Drill & Machine Co., Birdsboro, Pa.
H. E. Field, Farrel Foundry & Machine Co., Ansonia, Conn.
Ronald Drysdale, Boston, Mass.
L. Wiard, Wiard Plow Co., Batavia, N. Y.
Morton Otis, New England Gas & Coke Co., Boston.
Chas. H. Billings, Barney & Smith Car Co., Dayton, O.
Andrew MacDuff, Stilwell-Bierce & Smith-Vaile Co., Dayton, O.
Fred. A. Hoyt, Barbour-Stockwell Co., West Somerville, Mass.
E. K. MacNutt, Watertown Arsenal, Watertown, Mass.
A. K. Beckwith, Beckwith Estate, Dowagiac, Mich.
J. O. Henshaw, U. S. Bartlett Co., Boston.
C. S. Lovell, Tabor Mfg. Co., Philadelphia, Pa.
F. C. Ringer, Hawley Down Draft Furnace Co., New York.
C. S. Bell, C. S. Bell Co., Hillsboro, O.
W. H. Coffin, T. P. Kelly Co., New York.
S. D. Tompkins, Smooth-On Mfg. Co., Jersey City, N. J.
N. J. O'Donnell, G. H. Lincoln Co., Boston.
B. F. Pierson, Hanson & Van Winkle Co., Newark, N. J.
Henry A. Carpenter, A. Carpenter & Sons Foundry Co., Providence, R. I.
Alva Carpenter, A. Carpenter & Sons Foundry Co., Providence, R. I.
E. B. Gilmour, Filer & Stowell Co., Milwaukee, Wis.

Wednesday's Session.

(Special Telegram.)

BOSTON, June 18.—The registration shows a considerable increase over that of yesterday. After visiting the engineering laboratory of the Massachusetts Institute of Technology the members met for the discussion of papers. Those read this morning included "Some Methods of Increasing Foundry Production," by David Reid, Biddleford, Me.; 'Shop Conditions," by Hugh McPhee, Bridgeport, Conn.; "Foundry Costs," by R. P. Cunningham, Holyoke, Mass.; "Cores and Core Arbors," by Edward B. Gilmour, Milwaukee; "Shop Tools and Rigs," by James A. Murphy, Erie, Pa.; "Technical Education," by Prof. R. H. Richards, Boston. This afternoon a carriage drive was taken through the parks, bringing the visitors to the plant of the Walker & Pratt Mfg. Co., at Watertown, where lunch was served. A vaudeville entertainment and a smoker are booked for the evening.

Jones & Laughlins, Ltd., Advance Wages — Steel Corporation Improvements.

(Special Telegram.)

PITTSBURG, June 18.—Jones & Laughlins, Ltd., have just announced a voluntary wage advance for all their employes in the Pittsburg district except tonnage, piece work and office men. The advance is 10 percent except where this would not bring the wage up to $1.50, the minimum being advanced from $1.35 to $1.50. Between 6,000 and 6,500 men are benefited, including mill, furnace, yard and coke workers.

C. M. Schwab, who passed through Pittsburg last night on his way from Cresson to Chicago, is quoted as stating that the improvements planned for the Pittsburg District will be carried right through regardless of the result of pending litigation over the conversion plan of the United States Steel Corporation.

The Seamless Tube Co. has optioned 14 acres of ground at $3,500 an acre adjoining its plant in McKeesport. It is now employing 225 men and will probably double its capacity.

It is reported that Duquesne, Pa., business men contemplate forming a company capitalized at $10,000 to erect a tin plate and terne plate dippery.

Machinists' Demands at Pittsburg.

(Special Telegram.)

PITTSBURG, June 18.—A conference has been in session all day at Hotel Lincoln between the employers and W. A. Shaw, business agent, and four others representing the Pittsburg District of the International Association of Machinists, relative to the men's demand of 10 percent advance July 1, with certain changes in apprenticeship rules. The best offer of the employers will be learned and reported to a mass meeting of the men tonight. The union may make some concession. The conference covers the Pittsburg District, including Pittsburg and outlying towns.

Sheet Manufacturers' Meeting.

(Special Telegram.)

PITTSBURG, June 18.—No session of the sheet manufacturers was held this morning but a meeting is appointed for the afternoon with eight mills represented. The report of W. F. Bonnell, the commissioner, will be heard and unfinished business completed. No new business is probable. Newport, Whitaker and Laughlin mills are not represented.

The Colonial Foundry & Machinery Co., New Haven, Conn., has been incorporated with a capital stock of $100,000.

DINNER TO O. P. LETCHWORTH.

The return of O. P. Letchworth, the well known president of the Pratt & Letchworth Co., of Buffalo, from an extended trip to Europe was made the occasion of a pleasant gathering in his honor at New York, Thursday evening, June 12. Mr. Letchworth's record as president of the National Founders' Association for two years and his splendid work in behalf of a better relation between foundry employers and employes, have won him the esteem and respect of his co-workers. To give expression to their regard a number of these gentlemen arranged a dinner to Mr. Letchworth at the Cafe Martin, 26th St. and Fifth Ave. Owing to imperative business engagements a number who desired to attend were unable to go to New York, but not a few traveled from interior cities to be present. The letters and telegrams of regret from absentees spoke a warm welcome to the guest of the evening and the obligations of the senders for the work he had done for his fellow manufacturers.

There were present Wm. D. Sargent, president American Brake Shoe & Foundry Co., New York; F. T. Towne, Yale & Towne Mfg. Co., Stamford, Conn.; M. H. Barker, American Tool Machine Co., Boston; S. J. Meeker, Newark, N. J.; C. C. Smith, Union Steel Casting Co., Pittsburg; C. M. Greiner, Pitts Agricultural Works, Buffalo; Fred Frazer, Frazer & Jones, Syracuse, N. Y.; Gilbert H. Johnson, Isaac G. Johnson & Co., Spuyten Duyvil; Stanley G. Flagg, Jr., Stanley G. Flagg & Co., Philadelphia; Richard C. Oliphant, Trenton Malleable Iron Co., Trenton, N. J.; Herbert B. Atha, Benj. Atha & Co., Newark, N. J.; John A. Penton, Detroit; Antonio C. Pessano, president Great Lakes Engineering Works, Detroit; Willis Brown, Walker Foundry Co., Erie, Pa.; Geo. W. Cope, *Iron Age*, New York; Elias M. Johnson and Isaac B. Johnson, of Isaac G. Johnson & Co.; A. I. Findley, *The Iron Trade Review*. The after dinner program was presided over by Wm. D. Sargent, who gave Mr. Letchworth a formal welcome home. In responding Mr. Letchworth referred to the great gratification with which he returned to his home friends, home scenes and home work. The other speakers were J. A. Penton, A. C. Pessano, Geo. W. Cope, Willis Brown and A. I. Findley.

Morgan Engineering Co. Strike Ended.

The machinists' strike that has been on at the plant of the Morgan Engineering Co., Alliance, O., since February, came to an end this week. The company had discharged an insubordinate union workman. The union demanded his reinstatement, also recognition of the union and placing the plant under union control, with nine-hour day and time and one-half for overtime. The company has conceded the nine-hour day to the machinists and allowed time and one-half for overtime. For two years past it has been paying time and one-quarter for overtime and has worked 55 hours a week. The concession in time thus amounts to 10 minutes a day. The union concedes the right of the company to discharge and hire whom it sees fit, and the plant will be run as an open shop, the non-union men now employed to be retained without any interference from the strikers.

The Standard Bronze Co., Pittsburg, was chartered Monday with $5,000 capital stock, the directors being John Hutzen, W. A. Cochran and E. S. Hale, the last named of Braddock. Mr. Cochran was formerly in the foundry business at Leechburg and Avonmore, Pa.

The threatened strike of molders in the Pittsburg district has been averted by the employers giving the men an advance in wages less than the original demand. The men asked an advance of 10 percent, and a raising of the minimum rate from $3 to $3.25. The ultimatum of the employers belonging to the National Founders' Association to pay an advance of 6⅔ percent, with a minimum rate of $3 a day, has been accepted, to date from July 1, when the men had threatened to go out. The scale will be presented to the founders not members of the National Founders' Association, with a demand that an answer be returned by June 28, otherwise a strike will be started at these foundries July 1.

Allis-Chalmers Co. Strike Settled.

After one of the most memorable strikes in the history of labor unions in Chicago, the Allis-Chalmers Co. and its striking machinists have reached an adjustment of their differences and the latter have returned to work. By the terms of the agreement, the men get an increase in wages of approximately 11 percent, or to the basis prevailing in these shops for some time, and they in turn agree to a week's work of fifty-five hours, ten hours daily and five hours on Saturday. The original demands of the men were for a 12½ percent advance and a nine-hour day. The conference between the company's officials and representatives of the striking machinists was held Tuesday, June 10, at the Union League Club. The terms on which the company were willing to settle their differences with the men were submitted to the strikers by their representatives at a mass meeting held the following day and were immediately ratified, the men agreeing to return to work Monday, the 16th.

Canadian Pig Iron Exports.

The recent arrival on the Clyde of cargoes of Canadian pig iron draws attention to the export trade of Canadian pig iron to our market. The trade during the pesent year has increased enormously in comparison with other years. The Canadian trade returns show that, for the nine months ending March, our total imports were 70,554 tons, valued at £138,000, or about 39s. a ton. In 1901 the quantity of Canadian pig iron imported during the same nine months was only 1,524 tons. The Canadian exports for the same period to all countries have very much increased also. To the United States, for example, 5,109 tons were exported, against 418 tons for the same period last year. The total Canadian exports for the nine months ending March to all countries were 76,276 tons, compared with 2,958 tons for the same period in 1901. It is significant that the exports of pig iron to Great Britain alone during the past nine months were in excess of the total production of pig iron in Canada in 1898.—[London Iron and Coal Trades Review.

The Reading (Pa.) Iron Co. has made an advance in wages of puddlers from $4.25 to $4.50 a ton.

W. G. Houck, of the Buffalo Structural Steel Co., has sailed for Europe to hunt in the German and other markets for steel which he cannot obtain at home to fulfill contracts under way.

The directors of the Pennsylvania Steel Co. have decided to issue $7,500,000 more bonds. This will increase the bonded indebtedness from $7,000,000 to $14,500,000. The company desires to purchase extensive ore mines and furnaces at Cornwall, Pa. The new issue of bonds will bear 5 percent.

At a meeting of the shareholders of the Dominion Iron & Steel Co. and the Dominion Coal Co., at Montreal, a lease of the output of the coal company's mines was ratified. The lease is $1,600,000 per year and 7½ cents a ton royalty on all coal mined in excess of 35,000,000 tons in any one year.

The Mingo Foundry & Machine Works, with chief works at Williamson, Mingo county, W. Va., has been incorporated with an authorized capital stock of $10,000. Incorporators are S. A. Wellman, J. F. Wellman, D. P. Starkes and B. B. Campbell, all of Williamson.

Charles H. Besly, Chicago, will build a three-story factory on West Lake St., at a cost of $40,000.

SUGGESTED AT THE SHOP.

BY F. O. REMAN.

Now that the learned professor who presides over the Institute of Technology at Boston has given a lusty boost to the mechanical engineer, it is up to those of us who are connected directly with the oversight of the shop to filch some of his glory. I read in *The Iron Trade Review* that at the recent meeting of the American Society of Mechanical Engineers, the M. E. was spoken of as the man of the hour and that the training he receives may come in mightly useful in some other direction than that to which it is supposed to lead. The case was cited at the Boston meeting of the two students of mechanical engineering who became clergyman—"theological engineers." Maybe it is all well understood but it never seems to me that the mechanical engineering profession ever gets the appreciation that ought to come its way. All mechanical engineers are not managing plants and there is a vast difference between designing a machine, making it, and then selling it at a profit. And if the making of the one machine extends out into the manufacture with all the incidental struggles with jigs, fixtures, etc., complicated with a few labor troubles now and again, then the fellow in charge may bring up to the front all the technical training and stock of patience and grit to keep matters in motion. I take it that a good share of this work is being done by men who are best known as mechanical engineers, whether they do the above series of jobs as a whole or whether they have charge of a part only; it all depends upon the nature of the work.

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My own impression of the training which has brought a man into a position where he successfully handles the detail of managing a machine shop,, big or little, is that it cannot get the praise that really belongs to it. The technical education may have been dug out of text books without the help that goes with the teacher who can adapt the instruction to the rate at which the student can digest it. Whether the knowledge has been got at in one way or the other is not so important as having it, and the result finally is of the most importance.

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Just now when there is talk of strikes in all sorts of places and in all kinds of industries, it is timely to say a word or two about the way a struggle of this sort appears to me. My opinion one way or the other may matter little, but it does seem that there is a peculiarity about these strike movements which makes them take on the symptoms of certain diseases. It seems infections; and when the trouble is in the air everything is ready for a stampede. Here is where argument is useless and anything of that kind must be used before the fit of unrest gets firmly rooted.

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The man in charge makes his contract to build a machine profitably with all the chances for failure that an uncertain market for supplies may impose. He counts upon the careful handling of his shop equipment as a guarantee against the "innate depravity of machinery" or the "animate cussedness of things inanimate," as it has been termed. But most of all he depends upon the faithful service of his men during a definite daily labor. This is the most important element in the combination. When this is cut down in efficiency there is a carving of profit that may soon eat up the surplus on many another job as well.

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It does not seem to me that there is any other work that demands such a close hewing to the line as that of the managing mechanical engineer. When the other professions get up to his ways of doing business, doctors will guarantee results in so many days at a definite cost. No more consultations at the patient's expense; the doctor must shoulder the risk and deliver the goods. He cannot plead ignorance and call for a specialist unless at the cost of his personal funds. Maybe then the work will all be let by contract and a man will pay more for health than sickness, a sort of an insurance against a breakdown of the human machine. Lawyers are getting up to the standard set by the successful works manager. They are pledging results and are backing their judgment by contingency fees. If the legal machine does not work right during the official test, the lawyer suffers for it, and when the case is in favor of the attorney he stands a good chance of sharing the plunder.

* * * * * *

It is here that the works manager does not get his innings as a rule. Just about the time he has canvassed the situation and designed a machine to keep the shop busy (and incidentally to make money), got out his tools and circulated his story by judicious advertising, the strike microbe gets busy. This is where the manager may fall down and there seems nothing for it but to plead for a sober second thought before undertaking to club the shop prospects with a strike.

The Cramp Steel Company.

At the annual meeting of the Cramp Steel Co. at Collingwood, Ontario, the old board of directors was re-elected. The following facts are gleaned from the annual report:

The assets of the company are: 1,350 acres of ore lands in the Nippissing district of Ontario, held under Government patent, producing iron ore of high bessemer grade; 15 square miles of coal lands in West Virginia, estimated to contain in two seams opened 147,000,000 tons of coking coal; a limestone quarry at Collingwood, available for fluxing material and producing stone marketable for building purposes; a steel plant and 104 acres of water-front property at Collingwood. Liabilities are: Authorized $2,000,000 of 7 percent cumulative preferred and $3,000,000 common stock. There is no bonded or floating debt. Stock issued consists of $600,000 preferred, with which half as much common has been given as a bonus. Eighty-four acres of land, including half a mile of water-front, and a cash bonus of $115,000 were given to the company by the town of Collingwood. The property is tax-free. Twenty-four acres, with the quarries, were bought for $4,500. All the buildings are of stone.

The mills will start with a capacity of 250 tons per day, increasing to 500. The rail product is sold ahead for 18 months. The Government will pay a bounty of $5.40 per ton on all steel manufactured up to June 30, 1903, which will be reduced on a sliding scale till 1907, when it ceases. The company estimates that it will earn an average of $207,000 per annum in bounties up to June 30, 1907. The board of directors includes William M. Cramp, late general manager of Wm. Cramp & Sons, Philadelphia; President Collins of Central Iron & Steel Co., Indiana; Vice President Chandler, of Postal Telegraph; President Allison, of National Leather; and H. Prentiss Taylor. The other directors are Canadians.

The West Allis Malleable Iron & Chain Belt Co., Milwaukee, Wis., has perfected its organization by the election of the following officers: O. L. Hollister, president; C. S. Otjen, vice president; C. F. P. Pullen, treasurer, and W. H. Shenners, secretary. George F. von Sprecklesen, has been appointed manager and George Glessner, superintendent. The company was recently incorporated with $100,000 capital, all paid in and buildings costing $65,000 are already well under way. It is probable that the plant will be in operation in September.

The annual meeting of the Illinois Steel Co., Chicago, was held last week. No financial statement was made public as all such statements are made to the United States Steel Corporation. Two changes were made in the board of directors. Edward Shearson and Percival Roberts, Jr., resigned and F. H. Foote and L. D. Doty were elected. Officers and directors are as follows: E. J. Buffington, president; T. W. Robinson, first vice president; F. H. Foote, second vice president; T. J. Hyman, secretary and treasurer. Executive committee—E. J. Buffington, E. H. Gary, C. M. Schwab, T. W. Robinson, T. J. Hyman. Directors—E. J. Buffington, E. H. Gary, C. M. Schwab, E. C. Converse, T. W. Robinson, F. H. Foote, K. K. Knapp, W. D. Haynie, W. L. Brown, L. D. Doty and T. J. Hyman.

THE FRANCE METALLIC PACKING.

The illustrations, Nos. 1 and 2, show the principle on which the France packing is applied. The joint is made by three sets of rings, 1 and 2, 3 and 4, 5 and 6. The rings are made in the case C, the three sets being separated by the inner walls or partitions of the case. Each ring is made in three segments with sliding joints, as in Fig. 2. The lines of these joints are cleverly arranged to form the sides of an equilateral or equal-sided triangle, which is completed by the dotted lines in the figure, and whose coinsides with the center of the rod. Each ring is held to the rod by an encircling coil spring CS of non-corrosive metal, lying on a groove in the outer circumference. On account of the angles of the sliding joints, the ring segments are free to move radially in or out from the center of the rod, and thus maintain the steam joints. This movement of the segments is shown on an exaggerated scale in Fig. 3. The two rings of each pair break joints and are held in place by dowels.

The packing shown in Fig. 1, may be applied to existing stuffing boxes taking fibrous packing 5/8 inch and larger. The case C is split or made in halves, for cases where the rod cannot be disconnected. For old stuffing boxes which are too small in diameter to receive the case, a special form of solid case is made and placed entirely outside the stuffing box as shown in Fig. 4. When applied to rotary rods such as Corliss valve stems, the packing rings grasp the rod tightly and rotate with it. Then the joint or wearing surface is between the rings and the case, and not on the rod.

A form of packing designed for high-pressure vertical engines is shown in Fig. 5. Here there are practically two sets of packing. The inner or main set consisting of four segmental rings, 1 and 2, 3 and 4, held in two balance rings b and B, which are made practically steam tight, the lower ring having a port opening to the balance pipe or drip D. This is left open to the atmosphere or connected to the receiver, thus preventing high steam pressure from accumulating behind the rings and forcing them too strongly against the rod. Below these is placed a watering ring W. The upper face of this ring is concave or cup shaped and connected by a port to the drain pipe D. Condensation following down the rod past the first set of packing is intercepted by a knife in ring W, and may be drained off either to the atmosphere or condenser; if to the condenser, packing rings 7, 8, 9 and 10 pack the air and preserve vacuum.

The latter method is used principally on marine engines where fresh water is valuable and insures a perfect dry rod. Adaptations of Figs. 1 and 5 are made to meet varying conditions of new and existing engines.

The ring which is the chief feature of this packing was first put on the market in 1897. A catalogue will be sent chief engineers or large steam users by A. W. France, Tacony, Philadelphia, or from Room 21, Schmidt Building, Pittsburg.

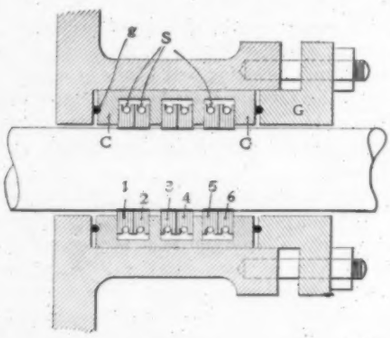


FIG. 1.

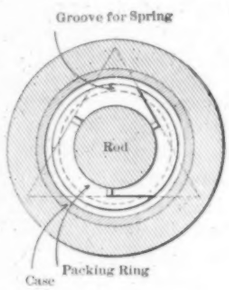


FIG. 2

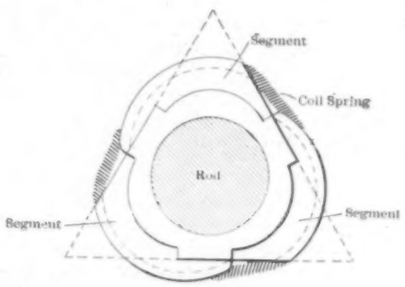


FIG. 3.

The Hollidaysburg Iron & Nail Co., Hollidaysburg, Pa., will start at once upon the erection of its new rolling mill which will be 200 feet long and 100 feet wide. The building will be located just east of the present plant and will contain besides a modern rolling mill several finishing mills. When the new plant is completed the old plant will be devoted entirely to puddling.

METHODS OF INCREASING FOUNDRY PRODUCTION.*

BY DAVID REID, BIDDEFORD, ME.

The success or failure of a foundry manager does not depend on his ability to give a correct chemical analysis of the material he uses, nor his ability to figure for his employer almost unheard of ratios in melting iron with coke, nor yet in his own unquestioned ability as a molder. The combination of the three, however, goes a long way in contributing to his success. This is an age of competition that is keen and sharp at all times, and at periods becomes so bitter as to be criminal in its effects, and necessitates the intervention of the law. Competition is healthy to any business, when carried on in a fair manner, and it is at the present time when you are in the market for work, that the production is of the most vital importance, for apart from the cost and sometimes taking precedence even over this, the question of delivery will often determine who shall have the contract. Right here is where a manager makes or mars not only his own future, but possibly that also of the firm, for in his ability to turn out the maximum production at a minimum cost with the men and room at his command, lies the whole secret of success.

During the past year, we have received through our *Journal* splendid articles on various topics that incidentally touch on this matter of increasing production. Prominent among these is the article on "Molding Machines" by Mr. S. H. Stupakoff, of Pittsburg. The molding machine from the plain and exceedingly cheap but useful press to the latest creation of the automatic, "which does everything but pour the molds," is the greatest factor the founder can use to increase his production, whether he is in the specialty or the jobbing line. In the article referred to, the writer has handled this subject in such a very able manner that I simply endorse his statements, and draw your attention to some very good advice he gives at the end of one of his papers.

Sometimes a foundry, while equipped with all the modern appliances for turning out work, finds itself unable to live up to its contracts, and the following method was employed in one, which, though not modern in all its equipment, yet competes successfully with those that are, in general light, machinery work. Being part of a large plant for the manufacture of light machinery, there came a time when the other departments were compelled to run night and day, with the natural result that the foundry, already taxed to its limit, was unable to keep up the work for the machine shop. Part of the work was therefore given to another foundry in order to help out. This was most unsatisfactory to everyone, except the other foundry, and the manager adopted the same system, with modifications, as the machine shop, namely two crews of molders, machine operators and laborers. The day crew began work at 5:30 a. m. and worked till 5:30 p. m., with one hour for dinner, receiving twelve hours as compensation, while the night crew started at 5:30 p. m., and did not finish till 12:30 or 1 a. m., getting paid for eight hours. The crews changed about every week and payments being made every two weeks, their average time was ten hours daily. On Saturday the men started one-half hour earlier, to avoid Sunday work. Previous to this arrangement, the men had been re-

*Read at the Boston meeting of the American Foundrymen's Association, June, 1902.

ceiving three hours extra as a premium for additional work, while the two cupolas, one small remodeled McKenzie and a large one of the same type, were supposed to be at their limit, giving in two heats 27 tons of a melt daily.

In the writer's opinion, the doubling of this amount of iron melted, which was accomplished and even exceeded at times, is the most creditable part of this method of increasing the production. The small cupola was used in the forenoon, being timed to drop bottom at 11:45, and bringing down a melt of 12 tons. Five hours later a laborer "chipped" it out, getting it ready for the melter and his assistant, who after eating their supper had this cupola ready for the blast at 9:30 p. m., when a second heat of 17 tons or over was melted in the one cupola, making a total of 29 to 30 tons every 24 hours from a cupola rated by the builders at four tons per hour. The main heat of the day was in the large cupola, which seldom went under 27 tons, this being arranged to get through at 5:30 p. m., there being one section of the shop that worked 10 hours straight. This system of increasing the production was carried on most successfully for a period of seven months, until business became normal again, and at the end of that time the foundry was nearly three months ahead of the machine shop, which is an exceedingly good thing to have during the time for labor agitations of various kinds.

As stated before, the cupolas used were of the McKenzie type and the height from bottom plate to bottom of charging door was only 9 feet. The daily consumption of fire brick used in patching was only eight on an average for the entire period of seven months, when the small cupola was relined to the charging door.

How about the molding sand? you will ask. My reply is

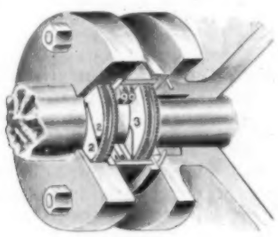


FIG. 4.

that this was taken care of by pouring the front of every floor that was to be used at night, in the first or morning heat, and having laborers take out the castings and wet the sand. When the balance of the work was poured and dumped, that sand was placed at one side leaving the cold sand ready to be used by the night crew.

In regard to the cost per pound of producing castings by this method, though not at liberty to give exact figures, I can assure you that it was less than the six months preceding, when the men were receiving premiums.

Mr. R. C. Cunningham in his paper on "Foundry Costs" brings up a point that gives a glimpse at the possibilities for increasing production by the division of labor where it belongs. The steel works and some of the specialty foundries have to a great extent solved this problem, and in the recent conference of the Iron Molders' Union and the Stove Founders' National Defense Association, it was recognized by the molders that the general trend of industrial development is toward employing skilled labor, as far as practicable, at skilled work. I am willing to predict that in the future—and how near for you individually depends upon your managers to a great extent—every molder without reference to the class or character of the work, will do nothing but produce, leaving the pouring, the dumping up of work, the cutting and mixing of the sand and all other laboring work, to unskilled labor. When you reach the point where the molder starts in the morning to practice the art at which he has served a number of years' apprenticeship, and continues at that work all the time he is paid for, then and not till then will you have solved the problem of the greatest production at the lowest cost.

A number of you here today, how large I do not know, run jobbing and general machinery foundries, and I venture to say that certainly 95 percent of your molders stop when the blast goes on, whether it gives them six or seven hours of molding time, and as all cannot pour first, the greater part of your crew are waiting their turn and doing nothing. What matters it if you insist on their staying in the foundry till the whistle blows, do you gain anything by it, except the moral effect it has on the other departments, which of course is no small matter?

You might ask how the molder would take to this system, and argue that though they appreciate the efforts in this line in the stove foundries where it is all piece-work, yet in machinery work might it not cause trouble? Having a large number of molders working on this division of labor plan, I can say that they are perfectly satisfied and think it the finest scheme yet devised, as they have no pouring or dumping to do, thus eliminating the hardest and hottest part of what formerly constituted their work.

The only objection that comes from any one is in regard to the pouring crew. But obstacles are encountered only to be overcome by the ambitious, and the men who do the pouring may be only laborers under the direction of a molder, trained for that special work as you would train them for the molding machine. Or if you prefer it, they can be culled from your apprentices, with the addition of a molder or two as leading hands, while a large majority of your molders keep the cost where it belongs by producing molds.

The dumping and cutting over the sand in the machinery shop where this system is in vogue, is accomplished by means

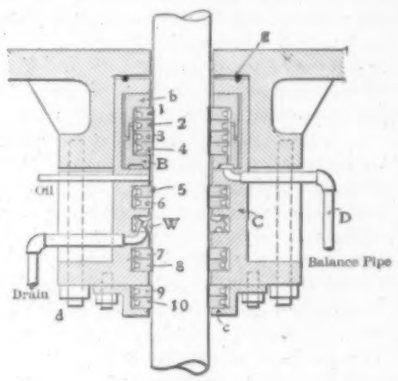


FIG. 5.

of a night crew of laborers, fifteen in number, who take care of the work of 120 men in 12 hours. That the pouring requires a certain amount of skill, is granted, for on that often depends the quality of the work; yet we have an instance right here in New England, where laborers, trained of course, pour up the entire amount of work put up by the molders in a foundry handling nearly 2,500 different patterns in a week, the weight in the casting varying from an ounce to 275 pounds.

The immediate result of this method of increasing the production was the saving of one day's wage all around, as the same amount, and over in fact, was produced in five days, which before with the same crew took six.

The annual meeting of the stockholders of the Kokomo Steel & Wire Co., Kokomo, Ind., was held last week. Directors were elected as follows: Richard Ruddell, A. A. Charles, G. W. Charles, A. V. Conradt, J. E. Frederick, Harry Ward, J. A. Kautz, F. E. Wickenheiser and Joseph O. Henderson. A. A. Charles was elected president; Richard Ruddell, vice president; J. E. Frederick, secretary, and Harry Ward, treasurer.

Officials of the American Tool Works Co., Cincinnati, deny the report that they are negotiating for the removal of their plant to Muncie, Ind. An officer of the company says that the plant will not be removed from Cincinnati.

The Morse Iron Works & Drydock Co., of Brooklyn, has recently introduced oil as fuel and the result has been satisfactory. President Morse says that oil is not only a better fuel than coal but it is also cheaper. He estimates that the cost of making steam can be reduced about one-half.

THE STRUCTURE AND FINISHING TEMPERATURE OF STEEL RAILS.*

BY ALBERT SAUVEUR.

It is well known that when a piece of steel is allowed to cool undisturbedly from a high temperature, it crystallizes, and that the resulting crystals or grains, as they are frequently called, are the larger, the higher the initial temperature and the slower the cooling. This was first forcibly stated by Professor Tschernoff in his masterly paper on "The Manufacture of Steel and the Mode of working it," communicated to the Russian Technical Society in April and May, 1868.

It is also well known that if the steel be vigorously worked (rolled or forged) while it is cooling from a high temperature, crystallization is prevented, but as soon as work ceases, crystallization sets in until a certain temperature is reached, which in the majority of cases is not far from 700 degrees C., and below which there is no further growth of crystals. If work be performed below that critical temperature the crystals are permanently distorted, being flattened and elongated in the direction of the rolling and this distortion of the crystals is greater the lower the temperature at which the work is carried on. Such distortion causes a decrease of ductility and, eventually, brittleness, a striking illustration of which is found in the drawing of wire, which must be frequently annealed to remove the brittleness produced by work at a low temperature. The annealing removes the distortion of the crystals and, therefore, the resulting brittlesness by causing the metal to assume a new and finer crystallization.

We may, for convenience, call the range of temperature during which steel crystallizes, and which extends from the melting point to the critical temperature (about 700 degrees C. in the case of carbon steel), the crystallizing range, and the work performed at these temperatures *hot work*, while the work done below these temperatures will be called *cold work*.

Hot work influences the final structure by preventing or retarding crystallization, while cold work distorts the crystals.

It follows from the above considerations that in working steel, as is done in the manufacture of so many implements, from a high to a much lower temperature, crystallization is retarded, *i. e.*, is made up to cover a much shorter range of temperature, extending from the *finishing temperature* (*i. e.*, the temperature at which work ceases) to the critical temperature. The resulting structure will, therefore, be finer grained, *i. e.*, will be made up of smaller crystals, than if the metal had been allowed to cool *undisturbedly* from a high temperature: the crystals will be the smaller the lower the finishing temperature. Should work be continued below the critical temperature the crystals will be distorted, which implies a loss of ductility.

It has been conclusively shown that the finer the structure, *i. e.*, the smaller the crystals ,the more ductile will be the steel, and since ductility is always a very desirable property, whatever the inteded use of the finished implement, we should so conduct our treatment of the metal as to confer upon it the finest possible structure. The importance of finishing steel implements at the proper temperature, therefore, need not be insisted upon. It is now appreciated by all enlightened metallurgists.

The manufacturers of steel rails have, more than any other producers of finished steel articles, given careful attention to the important influence of the finishing temperature upon the structure and the physical properties of their rails. In these days when the tendency is to allow more and more carbon in rail steel, in order to lengthen the life of the rail, the importance of securing all the ductility possible from the heat treatment stands pre-eminently at the front.

The importance of low finishing temperatures was clearly brought out some ten years ago at the South Chicago works of the Illinois Steel Co., through some extensive tests conducted by the writer, the results of which were summed up in a paper presented at the Engineering Congress in 1893. In spite of the conclusiveness of these tests, however, the management could not be made to take up any efficient measure toward lowering the generally too high finishing temperature of the rails. It was assumed that any step in that direction would interfere with the output and this was not to be considered. While the results given in the paper did not attract much attention at the time, a seed had been sown that was destined to bear much fruit. The importance of proper finishing temperatures gradually asserted itself until at the present day there is hardly a steel rail user or producer who is not fully alive to it. The results of many experiments along this line have been published within the last twelve months, which, although they merely confirm the conclusions reached some ten years ago, are, curiously enough, treated by their authors as newly discovered facts. This peculiar attitude on the part of writers who ought to be familiar with the previous treatment of their subject, attracted the attention of the *Railroad Gazette*, which says editorially, under date of May 31, 1901:

In all the discussions on the heat treatment of steel the matter has been treated as though it was new, and the writers appear to have forgotten the early work of Tschernoff, Metcalf and others, and the later work in the early 90's. It is well to realize thoroughly that this is no new fad. Notwithstanding all that has been said on this subject it has been a hard matter to get engineers to realize that steel can be rendered almost worthless by being finished too hot in rolling. When this important fact is fully appreciated we may expect to get the best results from steel, as means will be taken to give it the proper heat treatment in rolling.

In Mr. Metcalf's classical paper on steel, presented before the American Society of Civil Engineers, March 2, 1887, and reprinted in the *Railroad Gazette* of March 18, he says: "As steel congeals it forms crystals and the sizes are largely affected by the rate of cooling; slow cooling favoring the formation of large crystals, quick cooling and also agitation producing fine crystales. . . . In every piece of steel that is in existence today there is a sure record of the last temperature to which it was subjected as well as of the manner in which the steel was worked. I mean to say that for every variation of heat that is visible to the naked eye there is a corresponding variation in structure which is equally visible to the naked eye if the record be opened by fracturing the piece. . . . For a double quantity of carbon we have five times the difference in specific gravity, due to an equal difference in temperature. . . . The finest crystals and the best structure can only be formed by quick cooling and the violent agitation of the hammer or of the rolls."

At the World's Fair Congress of Engineers, in Chicago, Mr. Albert Sauveur, then in the employ of the Illinois Steel Company, gave the results of his investigation on the heat treatment of steel rails in six propositions, which are well worth the study of any one interested in this subject. His paper will be found in the *Transactions* of the Institute of Mining Engineers, Vol. XXII., from which we quote:

"A polished and etched section of steel rail when examined under the microscope does not by any means reveal in all its parts the same structure. This heterogeneousness of structure is due to the different temperatures at which the various parts of the rail leave the finishing-rolls, and to the unequal rate of their subsequent cooling. The propositions formulated in the first part of this paper should enable us to foretell such variations in the structure of a rail.

"The outside of a rail, leaving the rolls coldest and cooling quickest, will offer less chance for crystallization, and should therefore show a smaller grain than the inside, which, being the hottest and cooling down more slowly, will favor the crystallization of the metal, the size of the crystals or grains reaching its maximum in the centre of the head. It might also be inferred that the smallest grain will be found at the extremities of the flange, since this is always the coldest-finished region. Proceeding from the outside to the inside we shall find the tendency toward coarse crystallization gradually increasing."

The Kennedy-Morrison Rail Finishing Process.

The sudden renewed interest in the subject of proper finishing temperature for steel rails, just alluded to, led the Carnegie Steel Co. to a notable departure at their Edgar Thompson plant, from the ordinary mode of proceeding. This move on their part was given much publicity and has attracted the attention of all rail consumers. Stated briefly, the modification which they have introduced in the rolling of steel rails consists in holding the rails on a cooling table a few minutes before subjecting them to the last pass. It is argued that by so doing the rail is finished at a lower temperature, which is the desideratum aimed at.

Let us look critically into this new departure in rail rolling. The rail when it reaches the cooling table introduced before the final pass is at a high, or relatively high, temperature and is then allowed to cool until a certain lower temperature is attained. During this undisturbed cooling the metal evidently crystallizes and the rail must necessarily enter the finishing rolls in a crystalline condition, which will be the more pro-

*Read at the 5th annual meeting of the American Society for Testing Materials, Atlantic City, June 13, 1902.

nounced the higher the temperature of the rail when it reached the cooling table and the slower and more prolonged the subsequent *undisturbed* cooling. It also seems as if the single pass to which the metal is subjected after this crystallizing period cannot be sufficient to break up the crystallization just created. On theoretical grounds, therefore, if a material gain results from this method of proceeding, I do not see how it can be accounted for. Let us remember that any *undisturbed* cooling above the critical temperature constitutes a crystallizing period. By partially cooling the rail before the final pass, we shorten the crystallizing range after the rail has left the finishing rolls, but we create a crystallizing period just before the final pass, which is exactly equal in length to the diminution of the final undisturbed cooling. We do not, by so doing, decrease the *total* crystallizing range, which alone governs the size of the final crystals; we merely divide it, causing a part of it to be located immediately before the final pass and the balance immediately after, so that a rail treated by this process has passed through a crystallizing period of *exactly the same length*. The only beneficial effect, therefore, that can be claimed for this process is that it breaks up the crystals produced just before the last pass, resulting in a finer structure rail. If we consider that the reduction produced by the last pass is about five percent it seems hardly conceivable that so slight an amount of work could be effective in breaking a preexisting coarse structure.

Similar criticisms of the value of the Kennedy-Morrison process have been published by Mr. S. S. Martin, of the Maryland Steel Co., who contends, apparently on good ground, that any undisturbed cooling introduced in the process of rolling, in order to be effective in producing a finer grained rail, must take place at an early period, because then the considerable reduction, *i. e.*, the great amount of work to which the rail is subsequently subjected, will break up the crystals formed during that undisturbed cooling. It has also been argued, and rightly, I think, that those mills which do not reheat their blooms produce finer grained rails, for the simple reason that they finish their rails at a lower temperature.

To sum up, in order to confer a fine-grained structure upon steel rails, three courses seem to be opened:

1. To shorten the crystallizing period, *i. e.*, the time during which the rail is allowed to cool undisturbedly above the critical temperature (say about 700 degrees C.). In other words, the rail should be finished sufficiently cooled, and the finishing temperature will, of course, depend in turn upon the temperature of the ingot when rolling begins and upon the speed of the operations. The main objection to starting and carrying the rolling at a relatively low temperature is that it throws more work upon the rolls. The objection to a slow rolling speed and handling of the material is that it decreases the output of the mill. Both objections imply an increase in the cost of the rail.

2. To cause a part of the crystallizing period to occur previous to the final pass, *i. e.*, to allow the rail to cool undisturbedly at some stage of the operations, and for a short time, before completing the rolling. This cooling in order to be effective should occur at a sufficiently early stage of the rolling, in order that the resulting crystallization may be broken up through a sufficient amount of subsequent work and reduction. Such results would be obtained by placing the cooling table at the shears. The objection to this course is that the shaping of this cooler bloom into rails would require greater mechanical effort and, therefore, increase the cost of production.

3. To finish the rail at the temperature most desirable for easiness and speed of manipulation in rolling and then to reheat it to a temperature slightly above the critical temperature, a treatment which would result in the breaking up of the preexisting coarse structure, replacing it by a much finer one. This course would undoubtedly be the most effective of the three as it would not only impart a fine structure to the rail, but also a *uniform* structure to all its parts, while a rail not so treated must necessarily be coarser in the central parts than nearer the cooling surfaces, owing to the higher temperature of the center when the rail leaves the finishing rolls and to its slower subsequent cooling. The cost of such reheating treatment would undoubtedly be very great and possibly prohibitive.

SHEET MILL AND OTHER WAGE SCALE QUESTIONS.

Before the annual convention of the Amalgamated Association it was agreed between the American Sheet Steel Co. and the officers of the association that the present scale rates should be continued for the ensuing scale year. This agreement was ratified by the convention. It remained only to agree upon the various footnotes, and this was done at a conference held in Pittsburg Friday last. Only three changes were made from the present footnotes, one at the instigation of the company and the other by desire of the workers. The change made for the company adds the italicized words in clause 3 under the sheet mill scale, as follows:

"3. No. 18 and lighter, over thirty-two (32) inches wide, worked from slabs, ten (10) percent extra, *when run over and annealed in open furnace*, and for all bars and crop ends from plates to be worked into sixteen (16) gauge and lighter that are not cut to proper lengths and have to spread on mills when worked, seven (7) percent extra."

The changes made for the workers covered additions to clause 4 under the sheet mill scale and clause 17 under the sheet mill hands' scale, as shown by the italicized words:

"4. All sheet iron or sheet steel shall be weighed by the company after being sheared and opened, *and the company shall furnish the complete weight of each turn to the roller, or put the same in a convenient place in the mill within a reasonable time after being made.*"

"17. 25 gauge and lighter, double eighty-four (84) pairs, shall equal 105 pairs of double iron, and not to be averaged. *This to apply only to sheets sixty (60) inches long and shorter lengths.*"

No date has yet been arranged between the Amalgamated Association and the American Steel Hoop Co. for a resumption of the conference adjourned Saturday week on the bar iron scale. The conference will arrange certain matters for special mills which the steel hoop company has in Youngstown. The Republic Iron & Steel Co. formally signed the bar iron scale last Friday.

Arrangements have not yet been made for a conference between the American Tin Plate Co. and the Amalgamated Association on the tin plate scale. The base of the scale was agreed to before the late convention, and this action ratified by the convention, so that the conference will touch only on the footnotes, in which it is not probable any important change will be agitated.

President Shaffer spent Tuesday of this week in Moline, Ill., arranging a special scale for the Republic Iron & Steel Co.'s plant in that place.

The tin house scale for the year beginning July 16 next was arranged last week in New York between the American Tin Plate Co. and the Tin Plate Workers' International Protective Association. The main change was an advance in wages of about 5 percent to tinners on the new Jenkins patent tinning machine which dispenses with the riser. This machine has been in very successful use at the American plant at Elwood, Ind., and will probably be introduced at other plants of the company, as the patent rights were purchased some time ago. Some minor changes were also made by advancing wages in a few cases where they were less than paid at other plants for the same class of work. Several conferences are being arranged between the officials of the tin house workers' association and independent tin plate manufacturers on the scale. A conference will be held in Pittsburg this week between Secretary Lawyer and the Alcania Company.

The Carnahan Tin Plate & Sheet Co., Canton, O., has signed the Amalgamated scale, subject to any changes that may be made later on conference with the American Tin Plate Co.

The Foreman Can Co., Irwin, Pa., was chartered Monday with $22,000 capital stock, the directors being Amos L. Foreman and Benjamin M. Charles, Pittsburg, and Frank W. Taylor and John I. Stewart, Irwin.

A mass meeting of Pittsburg machinists was held Wednesday night of this week in connection with their demand for increased wages.

THE METALLURGY OF THE CUPOLA.*

BY H. E. FIELD, ANSONIA, CONN.

The quality of cast iron depends to a great extent upon cupola practice. The best of pig iron can be changed into inferior cast iron by poor melting; while an inferior pig may, by judicious melting and mixing, be used in high grade castings. There are hardly two cupolas in existence which work under exactly the same conditions, with the same sized tuyeres, the same amount of blast, equal height of tuyeres from cupola bottoms, etc. For every variation in cupola arrangement, there is a variation of the effect in melting iron. The greater the difference in the cupolas, the greater will be the variation in the melted product. Pig iron and coke merchants frequently find that two firms engaged in exactly the same line of work and using the same iron and coke, get very different results. Let us take as an example an experience which the managers of a certain foundry had with coke. They had used for a number of years a standard brand of Connellsville coke, and their cupola had been so arranged as to give the best results with this coke. The agents for another grade of coke, of a much lighter nature, finally persuaded them to try a car of their coke. The first day it was used the trouble began and continued to such an extent that no more of that coke would be taken as a gift, and the last of the car was worked up, mixed with one-half Lehigh broken coal. Upon inquiry, the cause of the differing results obtained by them and by the neighboring foundry, which was using the same light weight coke with excellent results, was found to be this: In their own cupola the distance from the tuyeres to the sand bottom was but 11 inches, while in the cupola in which the lighter coke was being used so successfully the distance was 20 inches. The tuyere area in the former was but one-half that of the latter, while the pressure in the former was greater by four ounces. This needs no explanation to one familiar with cupola practice.

Turning from coke to iron we find that the percentage of loss or gain of the metalloids or impurities varies with the height of tuyeres, size of bed, melting ratio, the size of the tuyeres, pressure of blast, amount of flux, and the method of fluxing. When pig iron, in the course of melting, comes in contact with the blast, and is acted upon by it, certain of the metalloids are burned out of the iron. This is true in all cupolas. The amount burned out increases with the amount of air forced into the cupola by the blower. In the same cupola, and under the same conditions, iron varying in composition will lose different amounts of impurities. As the melted iron, freed to a certain extent from some of the metalloids, passes through the incandescent bed of coke or coal, it absorbs new impurities from the bed. The amount absorbed varies with the cupola practice. From a heavy or deep bed, other conditions being equal, more impurities will be absorbed than from a light or shallow bed. The temperature of the iron at this time has a decided effect upon the amount of metalloids thus taken up by the iron, as does also the amount of flux used. With a hot running cupola and a large amount of flux, little sulphur will be absorbed by the iron, while a large amount will come off with the slag.

There has been much discussion in the last year of two as to whether certain of the metalloids lose or gain in passing through a cupola. The great variation in the results obtained by reliable experimenters has led to a general belief that there is no fixed rule which can be followed in figuring these cupola losses and gains. This idea, however, is incorrect, as I shall try to prove by taking up each metalloid separately.

Sulphur.

Under ordinary condition, iron melting in a cupola takes up sulphur from the fuel. The greater the percentage of fuel, and the greater the percentage of sulphur in the fuel, the greater will be the amount of sulphur absorbed by the molten iron. The ratio between the total amount of sulphur present in the fuel and the amount absorbed by the iron is dependent upon three conditions: first, the kind and quality of flux used; second, the temperature of the iron; and third, the composition of the coke and iron. A proper quantity of flux in a hot working cupola will take care of a considerable amount of sulphur. The sulphur present in the fuel as a sulphuretted hydro-carbon has no appreciable effect in increasing the percentage of sulphur in the melted iron. This accounts for the fact that many foundries melting with coal obtain castings with a lower percentage of sulphur in proportion to the amount of sulphur in the fuel than do foundries melting with coke. The greater the amount of manganese in the iron, the less sulphur will the iron absorb; and it is possible in cases of very high manganese iron for that iron to lose sulphur in melting, the sulphur passing off as manganese sulphide with the slag.

Silicon.

In passing through a cupola iron always loses in silicon. The amount of the loss depends upon two conditions: first, upon the amount of oxygen brought in contact with the metal in melting, and second, upon the composition of the iron as it goes into the cupola. In giving the amount of silicon lost in passing through a cupola, authorities generally mention a fixed amount. This may have been true concerning the grade of iron with which the writers were familiar. But it would be wholly untrue concerning other grades. The greater the amount of blast, the more silicon will be burned out. The higher the percentage of silicon, the greater will be the percentage of loss in passing through a cupola. (By percentage of loss, I mean the ratio of lost silicon to the original amount of silicon in the pig.) An iron running 4 percent in silicon, will lose up to 20 percent of its original amount, while the loss in an iron running .2 of 1 percent is hardly perceptible. This variation in the loss of silicon is accounted for by the fact that the lower the percentage of silicon in the iron, the greater is the affiinity of the iron for that silicon, and the more difficult will it be to oxidize it; while on the other hand, the greater the amount of silicon present in the iron, the less will be the affinity and the greater the amount oxidized in melting. The percentage of carbon in the iron has a great deal to do with the loss of silicon in melting. This, however, will be taken up later under the consideration of carbon.

Phosphorus.

A very slight amount of phosphorus is absorbed from fuel by iron in melting. It is practically, however, a constant quantity, the small increase being proportional to the amount of phosphorus in the fuel.

Manganese.

Manganese loses in passing through a cupola. Its action is that of a protector from oxidation and the amount lost in passing through a cupola depends upon the amount of blast and also upon the percentage of sulphur in the fuel. The greater the amount of air forced into the molten metal the more manganese there is lost as an oxide. The greater the percentage of sulphur in the fuel, the greater will be the percentage of manganese passing into the slage as a sulphide. Manganese is not united with iron as a compound; it is rather alloyed with it, having practically no affinity for the iron.

Carbon.

I have left this element until the last for several reasons. Principally, however, because its action is understood less than that of the other elements which we have to consider in connection with melting iron. Carbon is really the life of cast iron. Various articles and papers have been written and much discussion has ensued in regard to the effect of melting upon the carbon in iron. Some say that it gains, others that it loses. If the founder is to be able to control his mixtures by chemical analysis, he must settle this question for himself. The articles written upon this subject are wholly misleading. In the early part of 1900 there appeared an article in *Machinery*, written by Mr. J. E. Johnson, stating that iron lost carbon in remelting. This brought a reply from Mr. Thos. D. West in the following number, in which he contended that iron gained carbon in melting. Mr. West presented a record of the remelting of the same iron five times. In every case the iron gained in carbon. In a recent number of the *Foundry*, Mr. W. J. Keep, in answer to a question stated as a positive fact that iron lost carbon in passing through a cupola. These opposing statements from authorities on mixing iron, can but discourage anyone who is attempting to learn from the writings of others the

*Read at the Boston meeting of the American Foundrymen's Association, June, 1902.

changes which iron undergoes in melting. A few weeks ago the following was referred to me by a foundry foreman. In order to determine the loss and gain in impurities in melting in his cupola he melted a quantity of No. 2 iron. He had the pig and the resultant casting analyzed and figured the differences. He then remelted some of the scrap from this heat alone. He had this iron analyzed and figured the change in carbon, etc. These two results were sufficiently conformative to allow him to figure that his cupola lost 10 percent of the carbon in remelting. Sometime afterwards, having occasion to make castings which required a very hard grade of iron, he had these castings analyzed and found that instead of losing 10 percent of the carbon, his iron had gained in carbon in passing through the same cupola. It was a case of Mr. West and Mr. Keep illustrated in the same foundry. In the experiment of Mr. West, spoken of above, an iron running below 1 percent in silicon was used, and this iron gained in carbon. In Mr. Keep's stove plate work, iron running high in silicon is invariably used, and such iron will always lose carbon in melting.

Iron may both gain and lose in carbon in passing through a cupola, and whether the gain or loss predominates depends, first, upon the original composition of the iron, and second, upon the conditions or methods of melting. An iron while passing down the cupola has a portion of its carbon burned off, the quantity depending upon the amount of blast and the time which the iron consumes in passing through that zone of the cupola, where the oxidizing influences are at work. After having a portion of its carbon removed, the molten iron comes in contact with the incandescent coke in the bed, and from this it absorbs carbon. The hotter the iron, the larger the amount of fuel and the longer the iron remains in contact with this fuel, the more carbon will it absorb. If the amount of fuel is sufficient, the iron may absorb more carbon than it loses in passing the tuyeres, and thus the iron will have gained in carbon. If, however, the blast is heavy and the ratio of fuel to iron small, the iron will lose more carbon in passing through the oxidizing zone than it can possibly pick up from the bed, and thus the iron loses in carbon. These two conditions are at work every day in our cupolas. Melting with low blast and high percentage of coke will cause a gain, in carbon, while the high blast and low percentage of coke will cause a loss of carbon.

The original composition of the pig iron will have much to do with the loss or gain in carbon. An iron made at the blast furnace with a large percentage of fuel will be high in carbon. This if melted in a cupola with a small amount of fuel, will lose in carbon. While a pig iron low in carbon, made by a blast furnace using a small allowance of fuel, will, when remelted in a cupola with a relatively large amount of coke, gain in carbon. A low carbon iron, then, will tend to gain in carbon, while a high carbon iron will tend to lose in carbon in melting in a cupola.

Relation of Silicon to Carbon.

There is one more factor which we must consider in discussing this loss or gain of carbon in cupola practice, and that is the effect or rather the relation of silicon to carbon in this process. I have said that low carbon iron gained in carbon. Let us now qualify this statement by saying that a low carbon, low silicon iron, will gain in carbon. Carbon and silicon, although they are analogous elements in many of their properties, have always been considered to be almost opposite in their action on cast iron. The facts of the case are, that their actions are almost identical, although the results are different. Pure iron we know will absorb carbon up to 6.67 percent, while it will absorb silicon up to 23 percent. One part of carbon then is about 3½ times as effective on cast iron as is one part of silicon. We find this ratio to exist in our pig and cast iron to a marked degree. For every rise of 0.1 percent in carbon in our pig iron made under the same conditions, there will be a corresponding decrease of 0.35 percent in silicon, and vice versa. This applies in the same manner to our cupolas. When we melt a pig of say 3 percent total carbon and 1 percent silicon, we would expect under ordinary conditions, a gain in carbon. If, however, we melt a pig of 3 percent carbon and 4 percent silicon, we are sure, under the same conditions, to find a loss in carbon. Iron in the melted state may be thought of as a solution in which carbon and silicon each reduces the power of the iron to dissolve the other.

We have found then, that a small percentage of fuel, high blast, high carbon, and high silicon tend to cause iron to lose in carbon, while low blast, large percentage of fuel, low carbon and low silicon tend to cause iron to gain in carbon in melting.

When we consider the great variety of iron in use in foundry practice, and the divergency in cupolas, we can readily understand that no hard and fast rule can be laid down for all cases. Every foundryman must find out for himself, in his own cupola, and with the brands of iron which he uses, or else he must obtain his knowledge from someone whose experience is similar to his own.

Are our cupolas so arranged as to produce at the least cost, the best iron for our work? Are we, in order to save a few cents, running them with the least fuel possible, and paying out at the same time, dollars to obtain the superior grades of iron necessary when iron is melted with little fuel? Are we melting with heavy percentages of fuel, and then adding limestone to reduce sulphur, and steel to reduce carbon? Are we using high silicon to soften, when it is really high carbon that is needed, or high carbon when it may be that high silicon would answer the purpose very much better?

Adjustment of Cupola to Product.

For various kinds of work, different grades of iron are required. Stove plate and the like demand fluidity and softness, and to secure these an iron high in silicon, high in phosphorus, and rather low in carbon and manganese is most used. For light machinery, an iron high in silicon, medium in carbon and phosphorus and low in sulphur and manganese is necessary. Medium machinery requires an iron medium in silicon and carbon, low in phosphorus and manganese. In heavy machinery where weight rather than strength is desired, and where castings must be free from shrinks and segregations, iron low in silicon and phosphorus, high in carbon and manganese is essential, and a somewhat higher percentage of sulphur may be permitted. In castings where a high strength is desired, an iron low in silicon, low in carbon, low in phosphorus, low in sulphur, and medium in manganese is necessary. Cupolas then, should be so constructed as to best melt an iron suited for castings of their respective foundries.

The height of the tuyeres must regulate the manner in which the iron is taken from the cupola. Low tuyeres necessitate that the iron be drawn from the cupola as fast as it is melted, and either be held in a reservoir or taken away in small ladles. High tuyeres allow the iron to be collected in the hearth of the cupola and to be drawn off in large taps, and have the advantage of allowing crane ladles to be shifted while the iron is collecting in the cupola. When low tuyeres are used for filling crane ladles, if any time is apt to be lost in changing the ladles, two spouts should be used, one ladle being placed in position while the other is filling. We have mentioned that for stove plate and like grades of work, a high silicon, low carbon, low sulphur and low manganese iron is best suited. We have also mentioned that the amount of carbon and sulphur which an iron will obsorb is dependent upon the amount of fuel which it passes through. Hence for stove plate and like work, the lower the tuyeres, provided they are consistent with good melting, the better suited will the iron be for the work. This does not interfere with the general practice in stove plate shops of removing the iron in hand ladles and by trolley tracks as fast as it is melted. Light and medium machinery castings require only a medium carbon percentage, and are much more advantageously melted in low tuyere cupolas. The somewhat lower silicon used in this line of work furnishes a higher carbon than is present in stove plate iron, and the small bed gives a low sulphur percentage. In the heavy machinery where softness and soundness are required, a large bed has an advantage. Low silicon irons which are cheaper may be used, and the carbon absorbed from the deep bed makes an iron high in carbon, while the resulting high percentage of sulphur is less detrimental in this heavy grade of work. The deep hearth allows the collection of a large amount of iron and thus makes the custom of tapping into crane ladles practicable.

In the so-called strong irons, named by some gun iron, by others semi-steel, we have a somewhat more complicated

problem. These irons must, first of all, be low in carbon and low in sulphur, and it is just such irons as these that absorb most readily carbon and sulphur from the fuel. There are cupolas in operation in many of our foundries from which it is practically impossible to obtain an iron above 28,000 pounds tensile strength for the reason that the height of the tuyeres requires so great a depth of fuel in the bed, that the iron will absorb an amount of carbon and sulphur so great that it is impossible to get a strong casting. For the melting of this grade of iron, low tuyeres are essential, and, of course, the iron must be removed from the cupola as fast as it is melted. The majority of cupolas in operation today have extremely high tuyeres, and we have seen that these are advantageous for but a single grade of work. In advocating the lower tuyeres for cupolas I have always met with the above mentioned objection in regard to changing the ladles in time to prevent the iron getting into the tuyeres. It is to obviate this difficulty that I suggest the double spout on cupolas which are so arranged as to make this possible. The modern tendency in building cupolas is to make the tuyeres as low as possible in order to show a high fuel ratio, and I venture to predict that they will be built much lower as soon as the double spout arrangement is more universally adopted.

The time has come when all foundrymen must unite in improving cast iron. There has been a tendency for each foundryman to keep to himself the results of his own investigation. This is no more than natural, but it has proved a short sighted policy. The fact that you can make a good quality of castings, is no excuse for allowing another founder, through his ignorance, to deprive the cast iron market of certain classes of work which an intelligent iron founder could supply as efficiently as can the maker of steel. There is a large amount of work now being made in steel which good foundry practice could have saved for cast iron. The engineer who has once been disappointed is not apt to blame the maker so much as the product, and so steel is specified where cast iron, through faulty practice, has failed. In its struggle to hold its own cast iron must look to advanced cupola practice for its mainstay. Every branch of the iron business is advancing with rapid strides. Our foundries must wake up to a realization of these conditions. Engineers are more strict in their requirements of cast iron, while founders are drawing closer specifications around the pig iron furnace men. They in turn are constantly advancing, and I believe in spite of statements to the contrary, that blast furnaces have never produced a better and more uniform product than they are producing today. The adoption of standard methods for analyzing and testing, the agitation for improved grading, prove the steady progress in those branches which are vital to future foundry success. Let us then look to our cupola practice, and see to it that in the general progress the very heat of our foundry is not neglected.

For your Buffalo convention last year, I wrote a paper urging an advancement in foundry metallurgy, suggesting that time which was being spent on worn out topics be devoted to a study of advanced metallurgical conditions. With this thought in view I have studied the various cupola conditions most needing attention, and have presented to you a few of the conclusions at which I have arrived. I have again endeavored to clear away some of the disagreements which fill foundry literature, and if I have at all succeeded, let me once more ask you to press forward in this investigation, remembering that the very existence of the cast iron foundry depends upon its meeting the advancement of steel with advancements of iron, the cheapening of steel with the cheapening of iron, and the improvement in steel with improvement in iron.

W. G. Houck, of the Buffalo (N. Y.) Structural Steel Co., sailed for Europe last Saturday with the intention of buying 1,100 tons of structural shapes which will go mainly into local buildings contracted for recently, but for which the steel cannot be obtained in this country for the desired deliveries.

The new plant of the Twin City Fence & Wire Manufacturing Co., St. Paul, Minn., was placed in operation last week. The main building is 30x85 feet.

SOFT COAL STRIKE AS IT AFFECTS FURNACES.

Matthew Addy & Co., of Cincinnati, in their iron market review for last week say: "In this market the strike has been the main topic of interest. If the strike in the West Virginia and Virginia coal districts continues, as it certainly bids fair to do from our private advices today (June 13), though the situation may change any moment, the ironmasters in Southern Ohio are going to be seriously embarrassed. They depend on these districts for their supply of coke and not a furnace recently has been able to accumulate any stock ahead. Indeed, most of them for more than six months have been running from hand to mouth. The prospects ahead are exceedingly blue, for within the next few days it is highly probable that the furnaces in the Hanging Rock territory will be forced to bank. Some of the Chicago furnaces will also be affected. Conditions in other coal districts are such that it is extremely improbable that any coke can be drawn from them to make up the deficiency. This promised reduction in the output of pig iron is a serious matter. Consumers are already in trouble and a further lessening of the pig iron supply will be a very decided hardship. But this is the state of the case and the trade will simply be obliged to adapt themselves to the hard, cold facts. In Alabama and Tennessee fortunately no trouble is threatened and the furnaces there are all working to good advantage. The week has been one of good shipments both North and South. It is impossible, however, to satisfy consumers and they are calling for iron faster than it can be supplied. There is some inquiry as to probable prices for 1903, but as a general rule these inquiries are simply feelers without definite business in view. The disposition on the part of buyers is to await further developments before looking so far ahead as next year."

Oil Fuel for the Navy.

The navy may dispense largely with the use of coal and adopt oil for fuel. Under the direction of Admiral Melville, a board of engineers has succeeded in producing one-third more steam from a standardized boiler with oil than was possible with the best coal, and it is thought that the use of liquid fuel is on the point of tremendous development for marine purposes. In careful tests, extending over a whole year, the value of coal as a fuel has been accurately determined, and in the last week the same boiler has been fired with oil in the preliminary series of exhaustive tests, which will last several months. The results from the first have astonished the skilled experimenters. Afloat the supply problem is altogether different from those encountered ashore. In the crowded compartments of a warship, where cubic space and weight are the all powerful considerations, the aim is to evaporate the greatest quantity of water in the smallest boiler with the least weight of fuel, and usually without regard to expense. The water tube boiler, adopted three years ago, cut down the weight and volume of the steam producing apparatus, and its higher pressures enabled some saving in the relative weight and size of propelling engines; but the size of bunkers and the weight of coal were increased until coal was not successfully burning under forced draught, and the use of it aboard ship would have compelled the adoption of larger and heavier boilers, greater bunker capacity and other prohibitive conditions.

Admiral Melville announces the disappearance of most of these objections to oil, and the tests just beginning in Washington become of the greatest interest to naval officers, marine engineers and all steam users afloat in the world. With the remarkable results achieved by Admiral Melville's assistants with oil under forced draught, several new objectionable features developed, but they are not considered serious and will doubtless be overcome.

The Norristown Iron Co., Norristown, Pa., will shortly commence the removal of its plant from that place to Lebanon, Pa., where a site of 12 acres has been secured, located only a short distance from one of the plants of the American Iron & Steel Manufacturing Co. The main building of the plant will be 360 feet long and 117 feet wide. It will contain the puddling furnaces and the finishing mills. H. H. Light is president of the company and S. P. Light, secretary and treasurer.

The American Society for Testing Materials.

The fifth annual meeting of the American Section of the International Association for Testing Materials was held at Hotel Traymore, Atlantic City, June 12, 13 and 14, and throughout was a very successful and profitable meeting. Its most noteworthy action, as affecting the organization itself, was the change of the name of the association as indicated below. The attendance was the largest in the history of the organization, more than 75 persons being registered. The present membership of individuals and firms is 185. A vigorous campaign is to be prosecuted to increase this number to 1,000.

The meeting was opened Thursday evening by the president, Prof. H. M. Howe, who in his annual address referred to the importance and value of the society as a means for perfecting methods of manufacturing materials of construction and their use, by the exchange of ideas and experiences among the members. He spoke of the apparent differences in the practical workings of the American Section of the International Association for Testing Materials and the lines of operation of the European sections, inasmuch as the European part of the association lays more stress upon the establishment of methods of testing, while the American branch is more concerned about the standardization of methods.

The desirability of putting the American section upon a more solid basis of organization at home having become manifest, it was proposed in the opening business session and unanimously carried to change the society into a chartered organization under the name of: the American Society for Testing Materials. A constitution and by-laws were adopted and the society assumed its new position among the technical associations of the country under very favorable auspices. The new character of the society does not at all disturb relations with the international body. The by-laws provide that any person, corporation or society can become a member of the society and of the International Association for Testing Materials simultaneously, the annual dues being $3, of which $1.50 is transmitted by the secretary to the International Association for Testing Materials.

The following officers were elected to serve during the ensuing two years:

President, Dr. C. B. Dudley, chemist Pennsylvania R. R. Co., Altoona, Pa.

Vice President, Robert W. Lesley, Philadelphia.

Secretary, Edgar Marburg, professor of engineering, University of Pennsylvania, Philadelpnia.

Treasurer, James Christie, mechanical engineer, American Bridge Co., Philadelphia.

Member Executive Committee—John McLeod, assistant to the president of the Carnegie Steel Co.

Report on Specification.

On Friday, June 13, the session was opened by a report of Committe No. 1, which showed that the specifications, as recommended by the committee and adopted by the society were favorably received by the manufacturing and consuming interests of the country. Following this came the discussion of modifications in the standard specifications for steel rails adopted by the American section, these modifications being adopted by the American Engineering and Maintenance of Way convention at its annual meeting in Chicago, March 18, 19 and 20, 1902. An animated and very instructive discussion on rails, particularly on heat treatment and drop tests, the principal participants being John McLeod, H. H. Campbell, Dr. Dudley, P. E. Carhart, Albert Sauveur and Robert Job. Committee No. 1 had proposed a clause in the specifications, the object of which was for the consumer of rails to control at least in part the wearing qualities of rails by specifying a definite number of inches of shrinkage per given length of rails, this shrinkage varying with the weight of rails per yard. It was shown to the satisfaction of all concerned that at the present stage of knowledge of the influences of heat on steel in general, and under the variable conditions of rolling rails in particular, it was not advisable to adopt such a clause. The discussion brought out references to the fact that our principal rail mills had made, and are making, experiments on a greater or less scale to control the details of the manufacture of rails in such a way as to secure a finer grain or structure in the finished rail, which, under the present knowledge of physical metallurgy means better wearing quality of the rail, hence longer life and greater safety. It was decided advisable to collect further data upon this important subject.

What Grade of Steel for Bridges.

The topical question, "Is it Desirable to Specify a Single Grade of Open-Hearth Structural Steel for Bridges of Ordinary Spans?" stirred up the bridge engineers who were present, to an expression of their views on the subject. The appointed contributors to the discussion were A. P. Boller, Theodore Cooper, J. E. Greiner, John McLeod, C. C. Schneider and J. P. Snow. Mr. Schneider was of opinion that if one grade were agreed upon it should run from 56,000 to 60,000 pounds ultimate strength when tested in samples of at least ½-inch square section; the elastic limit to be at least 0.6 of the ultimate strength, and the product of the ultimate strength per square inch in pounds multiplied by the percentage of the elongation in 8 inches to be at least 1,500,000.

Mr. Snow favored a single grade of steel for structural purposes for three reasons: First, because bridges being alike in service what is best for one must be best for all; second, melters will become expert in the manufacture of this grade and the product will be more uniform than when the range is all the way from extra soft to quite hard; third, the shops will not be troubled as now by the impossibility of using stock built for other bridges to fill gaps in a job on which they are at work. The speaker would not agree to a single grade, however, unless it covered soft steel. He preferred a steel averaging 57,000 pounds ultimate strength, with a range of 4,000 pounds each way, but would join in approving an average if not exceeding 60,000 pounds with a range not exceeding 5,000 pounds each way.

Mr. Cooper said that in spite of the manufacturers' limit of variation of 10,000 pounds, there has been no trouble in getting this reduced to 8,000 pounds and he believed it possible to reduce it to 6,000 pounds. The difference in workability of 4,000 pounds is worth money and the manufacturer who can give the most uniform material should be favored even at an advance in price. He believed one grade material suitable not only for bridges but for ships or buildings. He would judge that a steel between 60,000 and 66,000 pounds ultimate would be regarded an average. He personally would consider a steel varying between 62,000 and 68,000, or an average of 65,000 as the ideal material, the ductility and other qualities being at least equal to those now required of medium steel.

Mr. Boller, while conceding that one grade of material might be adhered to for plates and shapes, suggested different requirements for rivets and eye-bar material. Mr. Greiner also contributed a brief discussion, favoring a steel within the range of 55,000 and 65,000 pounds ultimate strength.

It was conceded in the further discussion of the subject that with careful drilling of holes and harder steel treated otherwise carefully in the erecting yard a higher grade might also be used successfully, yet the conditions being what they are, it was unanimously agreed on a vote of those present that but one grade should be used.

Finishing Temperature for Rails.

At the afternoon session the papers on the "Finishing Temperature and Structure of Steel Rails" by A. Sauveur (printed in full elsewhere) and "Rail Temperatures" by S. S. Martin, received marked attention. Heat treatment and its influence upon the final quality of steel in general and rails in particular was again the chief topic of a very interesting discussion, as it always must be, considering the vital changes which may be produced in the structure of all grades of steel by proper or improper heat treatment.

Mr. McLeod, of the Carnegie Steel Co., claimed that as a result of experiments made at the Edgar Thomson Works of that company the life of rails, laid in their yards, had been increased to twice what it was under the old way when rails were finished comparatively hot.

When Dr. C. B. Dudley presented his paper on "The Relation between the Basic Open-Hearth Process and the Physical Properties of Steel," Mr. Webster suggested that it was a question of relative merit of basic and acid steel. It was said in reply that this was not the question and that the basic process

was merely mentioned because nearly all car axles (with the testing of which the speaker had had much to do) are now made from basic steel. Dr. Dudley pointed out that if axles do not have the high tensile strength necessary to withstand the destructive forces of alternate stresses, then they break in detail, irrespective of the homogeneity of the steel. It was pointed out that it seemed as if a given percentage of carbon in the basic steel in service did not always give that tensile strength which, in the mind of the engineer, is associated with that percent of carbon. Dr. Dudley pointed out that for the safety of the public and the prevention of wrecks it is absolutely essential that the steel in axles be of such chemical composition and physical strength as to prevent detail fracture of axles.

Mr. P. Kreuzpointner, of the Pennsylvania Railroad testing department, mentioned the fact that during more than 20 years of experience in testing new and old axles and examining hundreds of broken axles, he had found that steel under 75,000 pounds per square inch is liable to detail fracture. This tendency was so well defined that, as long as passenger axles were subject to tensile test, he gave no leeway at all in the interpretation of the specifications when accepting or rejecting axles, but drew a sharp and inflexible line at the words of the specifications, viz., 75,000 pounds per square inch, knowing from daily experience the serious risk taken in accepting axles below that limit of strength, when 80,000 pounds per square inch was prescribed and 75,000 pounds was the lower allowable limit of acceptance.

Mr. Campbell, general manager of the Pennsylvania Steel Co., took part in the discussion and brought out the important point that basic steel can carry more carbon per unit of iron than acid steel.

The Ethics of Testing.

The concluding paper of the session was by P. Kreuzpointner on "The Ethics of Testing." Among other things the speaker said that "in order that the work of devising specifications and the testing of materials of construction, have a reliable commercial value to both producer and consumer, we must follow faithfully the teachings of science; but in order to perform work faithfully, we must be able to command a high sense of duty and a high sense of duty means a high ethical standard. This ought to put the work of testing upon a higher plane than mere mechanical skill, and it is to be regretted that the factor of ethics receives so little recognition in estimating the commercial value of the man's work who does the testing. In work requiring purely mechanical skill, the result can be measured by rule and compass and these are tangible quantities. In testing, however, the results must be accepted in good faith and the man's integrity becomes a leading factor in the reliability of the work performed, because no one can measure or caliper the result.

"Because of this factor of ethics playing such a prominent part in determining the commercial value of the science of testing, it is neither scientifically correct nor commercially judicious to consider the work of testing of low commercial value, to be performed by any man of average intelligence, who is willing to accept low pay. And the closer the minimum and maximum limits of the specifiactions are drawn, the more complicated the work and method of testing is, the more this holds good." Attention was called to the national importance of this matter, much depending on the degree of confidence our work of testing and that of devising specifications commands abroad.

An Evening on Cement.

At the evening session the members not only enjoyed the "engineering smoker," but the elucidations of the merits of cements, no one, naturally, claiming any demerits, were so interesting and well presented by all who read papers or took part in the discussions that the evening was very profitable. Mr. Lesley presented the misfortunes of the cement men, due to the diversity of specifications, and did it in a graphic and convincing manner. He was reinforced and followed by G. S. Webster, A. Aiken, R. K. Meade, Clifford Richardson, R. L. Humphrey, and Prof. W. K. Hatt, of Purdue University. Not only was the session a very profitable one, but the cement industry of the country proved to be guided by able men.

A Final Session on Cast Iron.

Last but not least was the cast iron session of Saturday morning, with a number of interesting papers giving promise that henceforth cast iron will form an integral part in the proceedings of the society. Prof. Howe was unable to present his promised "Notes on the Constitution of Cast Iron," in which he was expected to give in some detail his theory of the relation of steel and cast iron. The first paper presented was that of W. G. Scott, of Racine, Wis., chemist of the J. I. Case Threshing Machine Co. In the absence of the writer it was read in abstract by the secretary. In the concluding portion of the paper some suggestions were made concerning mixtures, from which we take the following:

"Occasionally it happens that in a given mixture or grade of iron more strength is desired, or a closer grained iron wanted, without materially changing the silicon content. This effect may be obtained by changing some of the other constituents. For ammonia cylinders, air compressors, etc., the following is given: Silicon between 1.20 and 1.60 percent where the castings are allowed to cool slowly or are annealed. If not annealed silicon should be between 1.60 and 1.90 percent. Sulphur should not exceed .095 on account of hardness, but with a high total carbon it may run up to .150 percent without detriment, although with high sulphur there is always a chance of hard iron and excessive shrinkage, especially in low silicon mixtures. Phosphorus should be kept below 0.70 percent, and if great strength is wanted should be much lower, say 0.40 percent. Manganese should not exceed .60 percent, except in case of high sulphur, when it may rise to .80 percent.

"Medium iron for engine cylinders, gears, etc., may be made on the following formula: Silicon, 1.40 to 2 percent; 1.50 percent giving best results for gears and 1.60 percent for steam cylinders. If the castings have thin parts and have to be shaken out of the sand quite soon the silicon should be raised 10 or 20 points. Sulphur is best kept below .085, but if manganese be high (.60 or .70) the sulphur may run up to .100 percent. Phosphorus should not exceed .70 percent. Manganese should be between .30 and .70 percent.

"Soft iron for pulleys, small castings, etc., should have silicon between 2.20 and 2.80 percent; sulphur not above .085 percent; phosphorus may go up to 0.95 percent in small thin work, but where strength is wanted it would best be kept below .70. Manganese may be from .30 to .70."

The author laid down an approximate transverse strength of 2,800 pounds for hard iron, 2,500 pounds for medium iron and 2,200 pounds for soft iron. The following rules were laid down: To raise strength reduce graphite, phosphorus and silicon and increase manganese and combined carbon. To reduce shrinkage, increase silicon, graphitic carbon and phosphorus, and reduce sulphur. To prevent blow holes, reduce sulphur and increase managanese. To prevent kish, reduce graphite by increasing scrap or raising manganese.

Dr. Moldenke in the discussion following took exception to the use of the 1-inch test bar advocated by the writer for general use. He had found such a bar to test up to 85,000 or 90,000 pounds on malleable and 10,000 pounds on gray iron. He considered it not the thing outside the shop; there something more truly indicative of the strength of the casting was wanted. The engineer should come more nearly in his test bar to the characteristics of the work on which he expected to use it.

Mr. Sauveur referred to the claim of some foundrymen that cast iron was entirely different from steel. He believed a very close connection exists between the two. If you eliminate graphitic carbon from cast iron what have you left? Undoubtedly a matrix of steel, and nothing else, with cavities that were once occupied by graphitic carbon. If the cast iron was originally gray you would have a matrix of white iron. A knowledge of steel implies a knowledge of the matrix of cast iron. Suppose we want cast iron with the greatest possible tensile strength; we must use a matrix of the greatest possible tenacity. That means 1 percent or .9 percent carbon. A second requirement of strength would be to have as little graphitic carbon as possible. Referring to the control of carbon, the speaker conceded the difficulty of doing this with cupola metal; with the air furnace it was more attainable. The value of metallographic methods in determining carbon in cast iron was pointed out.

Dr. Moldenke remarked that he had been working along the line indicated by Mr. Sauveur. In view of the fact that white

iron constituted one-sixth of the foundry work of the country —about 600,000 tons out of a probable total of 3,600,000 tons, and a very large part of the 600,000 tons being chilled work— he believed the metallographic method in connection with chilled castings might become quite important.

Dr. Dudley recounted some of his experiences in the car wheel work of the Pennsylvania Railroad at Altoona. Whenever a new iron was brought to their attention for car wheel work the makers were asked to send several pigs. The iron was cut up into test bars in the pig and broken; then analyses were taken; and finally a piece was sent to the foundry for remelting. The laboratory after making the analysis sent the iron to the foundry with a prediction as to the depth of chill. The foundry had frequent occasion to note the failure of the predictions. The car wheel mixture used at Altoona runs 3.25 to 3.60 in total carbon, about .75 in silicon, .50 in manganese, .50 in phosphorus and in sulphur .13 to .15 now as against .08 formerly. The total carbon is lowered by adding to the mixture from 5 to 10 percent of steel rails. The chemical analysis hit the character of the resultant casting quite closely as a rule, but sometimes did not. The speaker found that there was something in cast iron of which little was known as yet, that had a great influence on chill. He questioned if oxygen had not much to do with it. Why two irons of identical analysis would not chill alike was still unexplained.

Dr. Moldenke referred to some experience in malleable work presenting similar difficulties. He had taken iron from various stages in open-hearth heats, over the 45 minutes required for a 12- to 15-ton heat, and noted the differences in the castings. He made two castings of a shape indicated on the blackboard, one end being a cube of 2-inch section, from which the width of the bar was stepped down by ¼-inch diminutions. The hottest iron, taken from the surface of the bath, was used for one of these castings and the coldest for the other. Of the two cubes at the large end of these castings the one poured from hot metal was stronger, and showed considerable chill, while the other was gray. He had found that low silicon iron melted much more quickly than gray or high-silicon iron. Mr. West detailed results of his experiments with hard and gray irons, showing that the former fused first. He found also that metal poured hot chilled most deeply.

The Present Status of Testing Cast Iron.

Dr. Richard Moldenke, secretary of the American Foundrymen's Association, read the following paper:

The following is summarized from conditions in America, as found in current specifications, in the technical literature, and through interchange of thought with the men identified with the testing of cast iron; then again, through discussion with notable men in Europe engaged in similar lines of investigation.

Tests of cast iron are carried out in two ways: By means of a supposedly representative bar, and by testing to destruction. The latter way is the preferable one, provided that it is fair to both consumer and producer. Our car wheel and coupler tests come under this heading, and the testing of pipe will form the text of a special communication to us today by one of our members. Tests to destruction in other lines will follow as fast as the consumer is in position to demand them.

It is, however, universally recognized that this system of testing is applicable only to a limited range of castings, and that other methods must be adopted to assure us of good results for the general run of the foundry product. This has always been attempted by means of a test bar, with what chances of success remains to be seen. The tendencies were two-fold: First, the short coupon attached to the casting, into which coupon the iron might or might not enter under conditions identical with those of all parts of the casting. Usually the chances were against even a fair representation, and this form of testing is deservedly looked upon with less favor than formerly by those who understand something of the characteristics of cast iron. The second method was to use very long bars (often 5 feet) and test them transversely by the gradual application of a stated load. The bars gave results depending upon the manner and time taken in loading, and are now known to be altogether too favorable to the founder. Moreover, the conditions of the test were exactly opposite of those met with in practice. An impact test would have been more suitable.

We have, however, today exactly this style of bar in use in Germany. About 3 feet long, square, and of pretty small cross section, the bar is broken transversely, and tensile test specimens cut from the broken pieces. On the other hand our German friends are desirous to have further light on the subject, and have appointed a commission to study the matter thoroughly. They further compliment us by utilizing our results in their investigations. The German specifications for pipe will no doubt be touched upon by another of our speakers today, for herein they have also been active in the Fatherland.

Many have been the tests made on bars, and each line of investigation has had the benefit of at least some previous recorded experience. The result has been the crystalization of ideas which has probably found as good an expression as any in the recent report of the committee appointed by the American Foundrymen's Association, wherein short, heavy round test bars, and these cast by hand, are recommended.

There is, however, another idea embodied in the report just alluded to, and this is so different from those generally accepted that it must be mentioned here. Our American founders, who know the material they are producing daily at least to some little extent, recognize the fact that even with the best of iron, a casting may be of inferior quality through improper conditions existing at the time of pouring, and this unknown to the average layman. They further know that a weak or unsuitable iron can be strengthened artificially, when making test bars, so that it may pass muster, and yet the castings will be inferior. For these reasons, therefore, in adopting the specifications they did, our American foundrymen cut loose from the very laudable, but entirely impossible production of test bars which are held to be identical with the casting, and selected a method which would give as nearly as true valuation of the quality of the iron going into the casting as possible. If afterwards, a casting could be tested to destruction, so much the better. The fact that the iron which goes into a casting is found to be of suitable quality, and of sufficient strength, is the only safe-guard which can really be expected from the test bar anyhow. This presupposes that the iron is cast into bars under conditions as fair as possible in the light of our present knowledge; that the bars of the size and shape which will neutralize as much as possible the variations due to the sand, the pouring temperature, and the pouring method, and that no artificial strength, or avoidable weakness be tolerated. By making such tests regularly, a founder can quickly satisfy himself, and possibly his customers, on the score of "quality" so far as the iron poured into castings is concerned. Even tests to destruction are not always as satisfying.

The present status of the question under discussion seems to indicate that the subject hinges upon whether producers will open their works to customers, and give them every facility to judge for themselves the quality of the iron made by means of the tests just spoken of; and on the other hand, whether customers will accept this as a guarantee of good faith, and the desire to give them the best work that can be made. The customer, it may be added, quickly becomes a competent judge of the good or bad conditions prevailing in the various foundries from which he draws his castings, when in contact and direct touch with them.

Foundry Experience Needed for Proper Inspection and Testing of Cast Iron.

Thomas D. West, of Sharpsville, Pa., read a brief paper on the above subject. He said that a compilation of all methods now used for testing the physical properties of cast iron would result in such a variety as to bewilder one not broadly experienced in the different branches of founding. "Of all metals, cast iron is the most complex in its physical structure. This is because of the fact that changes in the rate of cooling like grades of iron and cross sections produce radically different crystalline fracture or grain in the iron. Two pieces of the same cross section and poured from the same ladle of iron, can, by difference in the rate of cooling, be made entirely different in physical structure, one having a soft or open grain, and the other a hard dense grain, or chilled. Again, by uniform section and constant rate of cooling, but varying the silicon, sulphur, manganese and phosphorus, we can produce different grades, varying in degrees from a very soft, open-grained iron to hard or chilled iron.

"Where inspection of appearances, as to smoothness and beauty of finish only is required, or where work is duplicate, as in the case of car wheels, and subjected to certain prescribed tests that have proved proficient by numerous trials, then lack of foundry experience in the inspector may not be of vital importance. Where the inspection of castings is for the strength, solidity or durability, in castings that cannot be tested by breaking a duplicate, it is rare that the possession of foundry experience cannot prove of value, as the test bar, or any other special method of testing may often fail utterly in ascertaining the true character of a casting. For example, when castings like rolls, punch and shears, or flywheels, of which there are many, break from usage and the fracture exhibits shrink holes or a very porous grain compared with other sections, wherein has the test bar or chemical analysis proved of value, in showing a strong iron or apparent solidity? In

connection with the test bar and chemical analysis, the experience of broad founding can, in almost all cases, be well combined in passing judgment upon the durability of these castings. Foundry experience cannot give an inspector an X-ray eye with which to see the interior of castings, but to a certain extent it will aid in determining that may be expected, judging from methods used in pouring and feeding to supply the shrinkage of the parts that might be weak from porosity or shrink holes. There may be cases where an inspector experienced in broad founding can fortify his position by seeing a mold before it is closed, and being upon the ground at the time of pouring and feeding a casting, as it is not uncommon to have a mold provided with proper feeding heads and pouring gates, and yet the feeding be such as not to produce a solid casting.

"Aside from shrink holes, blow holes occur, and it requires foundry experience to judge of their existence. There are certain lines of castings that may have blow holes, while others have not. It generally requires some experience to define a shrink hole from a blow hole, and one can be as injurious as the other. As with a shrink hole, the blow hole may often be best predicted by seeing the methods of molding and casting, and the broader the experience of the foundry inspector the better, in passing judgment upon the solidity or strength of such castings.

"Next in order, is to judge of the evils of contraction. When castings are of disproportionate sections, one part will contract more than another, so as to leave an internal strain that no test bar records can properly indicate. Such strain may be greatly overcome by methods of cooling after a casting has been poured. Experience in founding enables an inspector to determine at what points weakness may exist or where to detect slight cracks.

"Sufficient has been outlined to illustrate that there is much beside test bar records needed to pass upon the durability of a casting. Nevertheless, the test bar has often a very important function. Again, in designing form and size and the method of molding and casting test bars, a broad experience in founding is essential. The want of this experience has resulted in methods being advocated that have caused much contention and confusion of ideas and retarded the establishment of what are truly practical systems for testing."

"High Strength of White Iron Castings as Influenced by Heat Treatment."

A. E. Outerbridge, Jr., of Philadelphia, read a paper detailing an experience in car wheel work in 1882, and the conclusions he had drawn from it as to the characteristics of what he termed "converted white iron." In the annealing of a number of car wheels, the dampers of the furnace had been left open by accident and the flame had infringed upon the treads of several wheels, producing soft spots. It was found that the white iron of the chilled portion had been changed to gray iron in spots, the white and gray portions of the tread being in general distinctly marked. The phenomenon was due, he concluded, to the change of some of the combined carbon to the free condition under the action of the flame. The speaker passed from this experience to a discussion of the so-called processes for the conversion of white iron into steel, which were announced now and then. Though sometimes the use of a secret chemical compound was a part of these processes, which converted cast iron axes, hatchet blades, etc., into so-called steel, the speaker considered it demonstrated that heat treatment alone was relied upon for the change. These products he considered to be not steel castings, though so sold, nor malleable iron, since none of the carbon was removed, but midway between the two. The paper discussed at length the changes in the carbon in cast iron under heat treatment and the important influence exerted by silicon. We expect to present it in full in a later issue.

The discussion, which was participated in by Messrs. Sauveur, Moldenke and Stanley G. Flagg, Jr., brought out dissent from Mr. Outerbridge's view that the process of converting white iron into gray differed substantially from ordinary malleable methods. It was pointed out that while castings which were to be converted into malleable were embedded in an oxidizing material for the removal of some of the carbon, the malleable methods of today also included annealing without the use of an oxidizing compound. The operation here consisted rather in breaking up combined carbon under the heat treatment, rather than the removal of carbon. Mr. Flagg referred to the use of brick dust, lime and other substances in this way, and to annealing with oil as now practiced by some manufacturers.

Specifications for Cast Iron Pipe.

Walter Wood, of Philadelphia, presented a discussion of "Current Specifications for Cast Iron Pipe." He said that the subject of specifications was now under discussion between water works engineers and manufacturers, with the expectation that final results would shortly be reached. It was also hoped that foreign manufacturers would agree to these specifications and thus make them international. In testing work connected with cast iron pipe founding, practice had changed from the 1-inch round bar to the 2x1-inch bar, 24 inches between supports, the required breaking strain being 1,800 to 2,000 pounds. Iron most suitable for cast iron pipe should range in phosphorus from .5 to 1 percent; manganese about the same range, though .75 to 1 percent is more desirable; silicon, from 1.25 percent for large pipe and 2.25 for lighter pipe. Sulphur is not wanted. Phosphorus is desirable on account of the shrinkage, though sometimes such a shrinkage is found as will pull off the bead of the pipe.

A Contraction Test for Metals.

The paper of Asa W. Whitney on "A Quick Foundry Contraction Test for Metals" went at length into a subject with which the writer is thoroughly familiar. We reserve more detailed account for a later issue. Mr. Whitney illustrated by a diagram a device he had developed to make the contact of the test piece with the chiller continuous and to indicate automatically the progress and extent of contraction of the larger diameter of a frustum of a cone. While not exhibiting any samples cast in the style of test mold he suggested, Mr. Whitney showed some photo-micrographs indicating in general what chill is and how much more fully metallography can define it than chemistry alone.

The discussion of the cast iron papers was interesting and spirited throughout and brought out much valuable material. The suggestion of the relation of steel to cast iron, which it was expected would be developed in the paper of Prof. H. M. Howe, is especially important as furnishing the probable keynote of cast iron investigations in the immediate future.

The members and guests present at the meeting could not but be impressed with the strong spirit of harmony and cordiality which pervaded the discussions, and which augurs the continued co-operation of all interested in the important work of the society. The secretary, Prof. Marburg, worked untiringly to make the meeting successful, and great credit is due all who had part in the arrangement of so valuable and varied a program.

Personal.

Among those in attendance at the meeting were the following: Henry M. Howe, New York; Chas. B. Dudley, Altoona, Pa.; John McLeod, Pittsburg; R. A. Carter, Pittsburg; Wm. R. Webster, Philadelphia; W. R. Hatt, Lafayette, Ind.; Samuel T. Wagner, Philadelphia; Albert Sauveur, Cambridge Mass.; C. C. Schneider, Philadelphia; Chas. M. Mills, Philadelphia; James Christie, Philadelphia; P. E. Carhart, Chicago; I. A. Colby, Philadelphia; H. H. Campbell, Steelton, Pa.; Edward M. Hagar, Chicago; W. A. Aiken, Pittsburg; S. S. Voorhees, Washington, D. C.; C. Kirchhoff, New York; P. Kreuzpointner, Altoona, Pa.; Tinius Olsen, Philadelphia; Jos. W. Bramwell, Philadelphia; Chas. S. Hill, New York; A. Falkenau, Philadelphia; M. Ward Easby, Philadelphia; Walter Wood, Philadelphia; Oberlin Smith, Bridgeton, N. J.; Jos. W. Bramwell, Philadelphia; Thos D. West, Sharpsville, Pa.; Stanley G. Flagg, Jr., Philadelphia; A. E. Outerbridge, Jr., Philadelphia; A. I. Findley, Cleveland; Wm. L. Hirsch, Pittsburg; Chas. Major, Philadelphia; W. O. Dunbar, Altoona, Pa.; Richard Moldenke, Watchung, N. J.; Chas. L. Huston, Coatesville, Pa.; Robert Job, Reading, Pa.; F. L. Humphrey, Philadelphia; Geo. E. Thackray, Johnstown, Pa.; Geo. S. Webster, Philadelphia; H. W. Spangler, Philadelphia; Chas. S. Churchill, Roanoke, Va.; Richard K. Meade, Easton, Pa.; Asa W. Whitney, Philadelphia; W. Purvis Taylor, Philadelphia; W. H. Broadhurst, New York; J. Y. Jewett, Clinton, Mass.

BETHLEHEM STEEL CO. SOLD TO SHIPYARD COMBINE.

The United States Shipbuilding Co. has become the owner of the Bethlehem Steel Co.'s plant at South Bethlehem, Pa., and will now be able to turn out a complete battleship, including guns ready for action. In August, 1901, Chas. M. Schwab purchased control of the Bethlehem Steel Co., this action preventing the Vickers-Maxim-Cramp deal from going through. It has been generally supposed that J. P. Morgan & Co. interests were connected with Mr. Schwab in the original Bethlehem Steel Co. deal. The price paid by the United States Shipbuilding Co. is said to have been $4,032,000 for 168,000 shares, this being the exact amount Mr. Schwab is reported to have paid for the interest he acquired last year. It was intimated at that time that he was buying the property in the interest of a proposed shipbuilding combine that would eventually include the leading plants in the country apart from the Cramps' and the New York Shipbuilding Co.'s. The capital stock of the Bethlehem Steel Co. is $15,000,000 or 300,000 $50 shares. The bonded indebtedness is $8,851,000.

Daniel LeRoy Dresser, president of the Trust Company of the Republic, which negotiated the sale, made the following statement on June 14: "The Trust Company of the Republic has today completed negotiations whereby the United States Shipbuilding Co. has purchased the Bethlehem Steel Co. This plant will be put in with the others that have been consolidated, and whose bonds will be offered to the public on Wednesday, June 18. With this acquisition the United States Shipbuilding Co. will be by far the most completely equipped and self-contained shipbuilding plant in the world, manufacturing everything itself, including its armor plate and guns. From the financial aspect, this acquisition makes the securities of the shipbuilding combination very desirable. Either the combined plants advertised today or the Bethlehem works itself are making earnings more than sufficient to pay the interest on the bonds issued, so that the earnings from either plant can be applicable to the dividends on the preferred and common stock. This is, on the present basis of earnings, enough, without figuring on any savings that may come due to the consolidation. This combination, with the enormous facilities behind it, its strong financial backing, and with the management it will have, is destined again to put this country in the position which she once held as the leading shipbuilding nation in the world."

Lewis Nixon, president of the Crescent Shipyard and a director of the United States Shipbuilding Co., said: "The acquisition of the Bethlehem Steel Co. by the United States Shipbuilding Co. is the most important industrial step taken in this country since the formation of the United States Steel Corporation. It gives to the United States a company capable of building a battleship complete with armament, armor and all equipment. No such company exists elsewhere in the world. Arrangements have been made with the United States Steel Corporation by which prompt deliveries of hull steel on favorable terms will enable us to promise vessels absolutely on time. More important, however, is the fact that, in case of bidding for vessels in competition with European builders, our hull steel will be obtained at a price that will not cause us to lose contracts on account of the price of steel. The Bethlehem Steel Co. is now making armor and forgings and building guns and gun carriages for the United States, Europe and Mexico, and work is in sight that will tax the capacities of Bethlehem and the shipyards far beyond that made by their present volume of orders. This company can now enter with confidence the foreign field and demand and obtain its share of the world's shipbuilding, despite the adverse conditions which have heretofore confronted the American shipbuilder. The shipyards not in our consolidation will reap the benefits due to the healthy competition, as our desire is to put ourselves in shape to compete for foreign work, and in doing this we shall be doing the greatest possible service to the American ship owner and doing our part in bringing back the American flag in the foreign trade. We can develop shipbuilding mechanics that will, in time, undoubtedly repeat the lessons of other industries having a steady demand for their products, and so give stability in employment and greater earning power to the workers. Whatever brings about a healthy and enduring shipbuilding industry here will benefit every calling, profession and trade, and every American should be proud to see the establishment of a company upon a financial scale and technical basis that insure success."

The plants of the Bethlehem Steel Co. include four blast furnaces, an iron plant consisting of seven double puddling furnaces, 17 heating furnaces and six trains of rolls; a steel plant with four 7½-ton converters; an open-hearth department with eight furnaces—two 40-ton basic and one 10-, one 20- and four 40-ton acid. In the forge and armor plate department are a plant for fluid compression of steel, a forging plant with presses and hammers, an oil tempering and annealing plant, crucible steel plant, blacksmith shops, foundry, machine shops, etc. The annual capacity of the rolling mills and steel works is 250,000 gross tons of steel ingots, 85,000 tons of open-hearth ingots, 260,000 tons of rolled products, 5,000 tons of armor plate, and large quantities of heavy steel shafting, steel forgings, and iron and steel castings.

Companies in the New Shipbuilding Combine.

The United States Shipbuilding Co. has been organized under the laws of New Jersey with a capital of $20,000,000; half common and half preferred. The following companies compose the consolidation: Union Iron Works, San Francisco; Bath Iron Works and the Hyde Windlass Co., Bath, Me.; Crescent Shipyard and Samuel L. Moore & Sons Co., Elizabeth, N. J.; Eastern Shipbuilding Co., New London; Harlan & Hollingsworth Co., Wilmington, Del.; Canda Mfg. Co., Carteret, N. J. The directors are Henry T. Scott, Lewis Nixon, John S. Hyde, E. W. Hyde, Charles R. Hanscom, Irving Scott, Charles J. Canda, Horace W. Gause, Daniel LeRoy Dresser, and John J. McCook.

The provisional prospectus of the company states: "The plants above mentioned are appraised at over $20,000,000, and the companies operating them have now on hand contracts for work at an estimated value of more than $36,000,000, on which the profits will be actually over $5,000,000. These plants have an earning capacity of $2,225,000 per annum. The fixed charges amount to $800,000 and the sinking fund $200,000, so it is self-evident that the net profits to be realized on the work actually in hand are sufficient to pay the interest on the bonds and the sinking fund for five years."

On May 2 the city of Cincinnati received bids on 1,000 tons of water pipe and on special castings. The United States Cast Iron Pipe & Foundry Co. was the lowest bidder on the pipe, at $30.60 a ton. This was considered too high and the supplies were readvertised. The second proposal developed only one bidder, the United States Cast Iron Pipe & Foundry Co., with figures as follows: $32 a ton on 8-inch pipe, $33 on 6-inch, $35 on 4-inch, $60 for special castings and $65 for loam castings. Its previous bids on the castings were: 100 tons of pipe specials, $58.50 a ton; 50 tons of loam castings, $80 a ton. Its total bid this time was $42,750, and its former bid was $40,450, or $2,300 less. The explanation for the advances is the higher cost of pig iron.

The Supreme Court of Pennsylvania has decided that good title can be given to the Cornwall ore beds in Lebanon County, Pa., and the Pennsylvania Steel Co. will now proceed to acquire them and certain furnace properties at Robesonia and Lebanon, as arranged about a year ago when the company was recapitalized. A special stockholders' meeting has been called for August 12 to authorize the issue of $7,500,000 5 percent bonds, to be secured by a divisional mortgage on the ore lands and furnace properties. The underwriting of the new bonds has been arranged for.

The American Iron & Steel Mfg. Co., Lebanon, Pa., has declared a dividend of 1¾ percent on its preferred stock, payable July 1 as registered June 24.

The address of the Ohio Solid Steel Co., of Cleveland, was incorrectly given in our last issue. The office of the company is at 430 Garfield Building.

The American Can Co. has decided not to rebuild the Toledo, O., plant which was recently destroyed by fire.

AMERICAN INVENTION VS. BRITISH ARMOR PLATE.

E. M. Johnson, of Isaac G. Johnson & Co., Spuyten Duyvil, New York, returned last week from a trip to England which was attended with inportant developments for the Johnson projectile cap. The Johnson cap is of forged steel and projectiles fitted with it have greatly increased capacity for penetrating armor. London *Engineering* of May 30, in connection with an elaborate article on recent tests in the presence of British naval officials, including practically the whole Board of Admiralty, announces the defeat of modern armor plate by modern projectiles. The efficiency of the Johnson cap, manufactured at Spuyten Duyvil, has been well recognized by the United States Navy, also by the German and Russian navies. The recent tests will undoubtedly lead to its adoption by the British Navy. We quote from the editorial in *Engineering* as follows:

"No more disquieting news from a naval point of view could be conceived than that which is recorded in the tabular report published elsewhere, for it establishes beyond any question the fact that armored plate manufactured according to the latest process, including cementation and subsequent hardening by chilling the face, has been defeated by modern guns and projectiles. A 6-inch plate and one of 12 inches in thickness have been attacked by the Bickers 6-inch and 7.5-inch calibre guns, with Johnson capped shot and shell, and on each occasion when these projectiles were used the plate was completely perforated. Apart altogether from the destructive power of the high explosives admitted in such shells into the interior of a ship through armour-plating, there is the equally disastrous effect of having the hitherto invulnerable water-line plating open to the sea. The ship's crew, the mechanism protected by armor, and the buoyancy of the vessel are consequently endangered, and that, too, by the attack of guns moderate in size and weight and in power, because it is obvious that weapons of higher calibre—9.2 inches and 12 inches—are proportionately more powerful. The importance of this triumph of the guns will be more fully appreciated when it is remembered that our modern battleships, already completed or in course of construction, are clad on the broadside with armour of corresponding resisting power to that defeated, but limited in the thickness to 9 inches, 8 inches, and 7 inches; Lord Goschen's 'mighty' cruisers, now being delivered, and representing a cost of a million pounds each, have only 6-inch armor, while in course of construction we have 16 armored cruisers of the Kent and Devonshire classes, most of them with 4-inch armor, and the others with 6-inch broadside belts. The fact that foreign powers—notably the United States, Russia, and Germany—have been striving, with the same energy as has been displayed by the Vickers Co., to develop a similar effect does not in any way lesson the anxiety with which these results will be received.

"The Vickers Co. have for several years been experimenting, with most satisfactory results, towards the increase of ballistics in guns, without which even the capped projectile could not avail; and with their 6-inch gun they have succeeded in developing a muzzle velocity of 3,000 feet per second, while for some reason which is not quite explicable our warships have been fitted with weapons in which the velocities have been limited to from 2,160 feet to 2,500 feet per second. The difference is most marked, meaning, as it does, a striking energy at 2,500 yards range of 2,922 foot-tons as compared with from 1,515 to 2,023 foot-tons for the service weapons. Corresponding superiority might easily be recorded in connection with guns of higher calibre, but this one instance will here suffice. Moreover, the admiralty are open to criticism in not realizing the immense potentialities of a gun of greater calibre, notably that of 7.5 inches, where a striking energy at 2,500 yards range of 6,627 foot-tons can easily be realized without any inconvenient increase in weight, since the United States Government, as well as some of the European powers, have adopted, for the secondary armament in warships, guns more powerful than the largely utilized 6-inch piece in British ships.

"But an important contribution to the defeat of modern hardened armor is the fitting of the shot or shell with a forged steel cap, which experience has proved protects and supports the point of impact upon a hardened plate, and enables the projectile point proper to find its way into the armor. Ten years ago Russia entered upon experiments with a so-called magnetic shot, in which the cap was secured to the projectile by magnetic attraction; but the Johnson cap has proved itself much more satisfactory, and the plates which have been perforated with this projectile, fired from a Vickers gun, establishes the success; an essential feature, of course, is the high-striking energy. The Johnson cap is of forged steel, cylindrical in form, with its bottom cored out to fit over the nose of the projectile itself. For securing the cap there is cut round the projectile a small groove, having at one point of the circumference a slight nick, so that when the cap, by hydraulic pressure, is forced to grip into the groove, the nick prevents any tendency to rotation, which would be prejudicial to the effective absorption of the force of impact by the cap.

"Turning now to the trials which have established the triumph of the Vickers gun and capped projectiles over the modern armor plate, it may be noted first, as regards the latter, that it was manufactured at Messrs. Vickers' works, where completely new plant has been recently laid down for the hardening of armor-plate according to the latest process, and both the 6-inch and the 12-inch plates tried and perforated were manufactured according to British Admiralty specification. Moreover, the first shots fired at these plates were arranged to exactly correspond with the Admiralty tests prescribed for the acceptance or rejection of such plates. Thus the attack was by a 6-inch gun, firing armor-piercing shot of 100 pounds weight, without a cap, and having a striking velocity of 1,960 feet per second, with a corresponding energy of 2,664 foot-tons. The shots with this energy, and without the caps, made practically no impression upon the plate, excepting the usual surface abrasion, while at the same time the projectiles were broken into many pieces. The first shot fired against the 6-inch plate was broken up, the point only remaining fused in the plate; but there were no cracks, and no sign of bulge at the back. Against the 12-inch plate the 6-inch shot in the fifth round developed the high velocity of 2,827 feet per second, with a corresponding energy of 5,542 foot-tons; but having no cap, the shot was completely broken up, although the point, which penetrated 3 inches, remained fused in the plate, and a large piece of the projectile rebounded to the extent of 20 feet from the front of the plate. These results prove that the plate was equal to the ordinary Admiralty requirements.

"As to the effect of the new shot fitted with the Johnson cap, photographs of the plates after the test carry convincing proof, and clearly establish the triumph of the gun with its new projectile, over the latest plates, and that, too, when developing relatively low velocities. Taking first the 6-inch plate, the third round was fired from a 6-inch gun with a Vickers shot fitted with the Johnson cap, the total weight being 105 pounds. The initial velocity was 2,007 feet per second, and the striking velocity 1,971 feet per second, corresponding to a striking energy of 2,829 foot-tons, with the result that the plate was completely perforated. This in itself is an important result, but more remarkable is the effect obtained from the 7.5-inch gun, which fired the second projectile at this plate. The striking energy here was 6,795 foot-tons, and the result established the immense superiority of this gun for cruisers as well as for the secondary armament of battleships—a point we have already referred to; because, not only did the shell perforate the 6-inch plate completely, but the point of it, weighing 92 pounds, was subsequently picked up in a sand heap at the rear of the target, having, after going through the plate, ploughed its way for 20 feet into this sand. One can quite easily picture the effect of such a shell, with its bursting charge of 6 pounds of explosives, finding its way through the 6-inch belt of one of our many modern cruisers, and exploding its lyddite charge in the interior of the ship.

"Referring to the 12-inch plate, three rounds were fired on May 9, also in presence of high Admiralty officials, with results corresponding to those attained with the 6-inch plate. The fourth and fifth rounds against this 12-inch plate not only establish the high velocity of the Vickers weapon of this calibre, but also the efficacy of the Johnson cap, and incidentally proved the advantages of nitro-cellulose powder as compared with cordite. Burning more slowly, it exerts a longer and therefore a more powerful propelling effect upon the shot, and at the same time does not erode the gun as in the case of

other compounds containing nitro-glycerine, whereby the ballistics are greatly reduced, as has been proved during the Transvaal war. Rounds four and five were fired from the same gun, the only difference being that in the one case (Round four) the Johnson cap was used. With the cap the shot passed completely through the plate, but was held up by the wood backing behind, and the rear end of the shell was about 9 inches from the surface. All the evidences point to the fact that water would be admitted in such case, as the wood backing and the steel plate, corresponding to the skin of the ship, badly bulged. But a 7.5-inch shell with a cap—the third round—defeated even this 12-inch plate.

"Without entering further into the details embodied in the official tabulated report, it may be deduced that a capped 6-inch projectile will completely perforate a 12-inch plate if such a velocity as 2,800 feet per second is developed, and this the Vickers gun can easily attain; whereas with an uncapped shot, even at this high velocity, the plate undoubtedly triumphs, the extent of penetration being only 3 inches. As for the 6-inch plate, which is much more extensively adopted in our armored cruisers, it has been fully demonstrated that a 6-inch shot, when capped, will effect complete penetration, even with a striking velocity of about 1,971 feet per second; and in the series of experiments carried out by the Vickers' Co. there are several examples of such plates being perforated and the shot remaining intact. Even at the risk of repetition, it is proper to point out that the 6-inch projectiles we have been referring to are not shell, but with the 7.5-inch gun on these trials shells were used containing the equivalent of a 6-pound bursting charge, and these completely perforated the 6-inch modern cemented plate with a velocity corresponding to a range of 2,500 yards. It may be thus taken that such a gun using lyddite shell with a Johnson cap could perforate the water-line armor of all the battleships of the Canopus and Duncan classes, as well as all the armored cruisers we are now building, making a very considerable hole and causing much internal destruction; while the 6-inch gun at a range of 2,000 yards could similarly defeat the 4-inch armor of the Kent class.

"There can be no question about the earnestness of the present Board of Admiralty and of their strong desire to bring the Navy into the first rank of efficiency, and we can only hope that the serious significance of the results attained will enable them to carry their desire more fully into practice. The nation itself will gladly foot the bill, and no difficulty should be experienced in securing the financial aid necessary. Lord Selborne has embarked upon a commendable policy of re-arming some of our ships which otherwise are fairly efficient, and it is incumbent upon him to ensure that not only will all the vessels be supplied with capped shot and shell, but that the guns will be fitted in such a way as to attain the high velocities necessary to ensure the fullest penetrative power for such projectiles. The difficulties are unimportant, and no armor-piercing shot now in store need be discarded, because the Johnson cap can very easily be fitted to any projectile at little cost, and with the result of increasing their efficiency by 30 percent even at moderate velocities. Since the French, Russian, German, and United States navies have adopted such caps, there is the greater need why our naval weapons should be thus brought into line, and for ensuring that the new guns to be fitted to our battleships and cruisers should be improved in their ballistics, while at the same time the 7.5-inch instead of the 6-inch gun should be adopted as the secondary armament of our battleships. This is the more important as these guns are not only of very great power, but attain a high rapidity of fire. At the trials to which we have been referring, a test was made to ascertain their quick-firing qualities, and it was found that, firing at a target 1,000 yards away, five aimed rounds were discharged within 31 seconds, representing a rate of fire of nine aimed rounds per minute. No more opportune time could be chosen for a spirited naval policy; the country still smarting under the sense of impotence displayed in connection with the Transvaal campaign, will welcome any well-defined and liberally-prosecuted policy by Lord Selborne and his board, while our great ordnance manufacturing firms are in an admirable position for carrying out extensive gun-construction work, as they are not, and have not been for some time, fully engaged upon such work."

MELTING STEEL WITH IRON IN THE CUPOLA.*

BY H. E. DILLER, CHICAGO.

It is well known that melting steel with iron in a cupola adds strength to the resultant casting. But to what degree this is so, and the best proportion of steel to use are not so clearly understood. With a view of learning something more definite in regard to these two subjects; and also to see if it were possible to trace some connection between the percentage of total carbon in the iron, and the tensile strength, I have made the tests given in the accompanying table. The tensile and transverse strength given are the average of two, and in some cases three, test bars. For the tensile strength a 1⅛-inch round bar was used. The transverse strength was obtained from a one-inch square bar placed on supports 12 inches apart. The object sought in the accompanying classification is to have the silicon about equal in the tests of each set, the amount of the other elements being as nearly alike as it was possible for me to get them.

Tests Nos. 1 and 2 show comparatively little difference in the chemical contents, except in the manganese and graphite. As the manganese in No. 1 should be beneficial to the strength of the bar, the only way to account for the greater strength of the iron from No. 2 is the lower percentage of graphite, or the molecular structure resulting from the 25 percent of steel in the mixture.

Comparing Nos. 3 to 7 we find that the strength increases with the percentage of steel used, and the decrease of total carbon with the exception of No. 7. In this 37½ percent of steel was used, and the total carbon was less than in any other test, but it is weaker than either No. 5 or No. 6. This being a solitary case it can hardly be used as proof that 37½ percent of steel is more than it is well to melt in a cupola. But test No. 11, which also contained 37½ percent of steel and more carbon, was only a little stronger.

Test No. 4 was considerably weaker than No. 5, but its higher percentage of sulphur with its lower combined carbon would seem to indicate that these bars were either cooled slower, or poured from duller iron than were the bars from No. 5, which may account for their being weaker than the No. 5 bars.

In looking at Nos. 8 to 11 we see that No. 9, although containing 12½ percent of steel is no stronger than No. 8, in which there was no steel. And No. 10 with 1.06 combined carbon, and 12½ percent of steel, gives less strength than might be expected. As these tests are so much lower in manganese than Nos. 8 and 11, it may be that their weakness is due either to the lower manganese or to the conditions of melting, which reduced the percentage of manganese so much more than in Nos. 8 and 11. The four charges each contained about .50 manganese before melting.

Nos. 13 and 14, each from charges containing 25 percent of steel, show a marked increase in strength over No. 12.

We find that all the tests from charges containing 25 percent of steel are stronger than those from the charges containing but 12½ percent, with the exception of No. 5, which is stronger than two of the tests which had 25 percent of steel in the mixture. The tests were made with pig iron, ferro-silicon and steel scrap, no cast iron scrap being used. This was done in order to better control the percentage of the elements in the iron.

In some cases when a large percentage of steel was added, it was necessary to use ferro-silicon to get the desired amount of silicon in the charge. To see how this and the steel mixed with the pig iron two tests were taken from No. 13, which contained 1,000 pounds of steel, 400 pounds of ferro-silicon (8.5 percent, silicon) and 2,600 pounds of pig iron. The charge was tapped from the cupola into a ladle, and the tests taken at different times, as the iron was being poured from the ladle. The one sample contained 2.53 and the other 2.54 percent of silicon.

Two tests taken in the same way from No. 14, contained 1.97 and 1.94 percent of silicon. This charge was made up of 1,500 pounds steel, 450 pounds ferro-silicon, and 2,050 pounds of pig iron. Similar tests from charge No. 2, which was made up of 1,000 pounds steel and 3,000 pounds pig iron, contained

* Read at the Boston meeting of the American Foundrymen's Association, June, 1902.

1.50 and 1.52 percent of silicon. These three cases offer pretty strong proof that the pig iron, steel, and ferro-silicon mixed thoroughly.

Although of a limited number, the tests given seem to indicate that 25 percent of steel will add about 50 percent to the

No.	Silicon.	Sulphur.	Phos.	Mang.	Comb. C.	Graphite.	Total C.	Tensile Strength.	Transverse Strength.	Percent of Steel
1	1.43	.047	.564	.82	.67	3.14	3.81	23060	2550	0
2	1.50	.065	.532	.33	.64	3.44	3.08	30500	2840	25
3	1.76	.062	.488	.53	.51	3.12	3.63	22180	2440	0
4	1.76	.139	.515	.57	.43	2.94	3.37	27090	2770	12½
5	1.77	.069	.339	.49	.56	2.87	3.43	32500	3120	12½
6	1.83	.100	.610	.55	.51	2.44	2.95	36860	3280	25
7	1.75	.089	.398	.35	.74	2.12	2.86	30160	3130	37½
8	1.96	.104	.446	.44	.63	3.18	3.81	21950	2230	0
9	2.12	.037	.410	.26	.38	3.26	3.64	21890	2470	12½
10	2.16	.060	.315	.20	1.06	2.30	3.36	26310	2670	12½
11	1.97	.093	.470	.48	.57	2.83	3.40	32530	3050	37½
12	2.35	.061	.515	.56	.54	3.40	3.94	21990	2200	0
13	2.53	.104	.490	.54	.60	2.56	3.16	33390	2850	25
14	2.36	.064	.327	.24	1.08	2.15	3.23	31560	3200	25

strength of the iron; and 12½ percent of steel, approximately 25 percent. The tests containing 37½ percent of steel were hardly as much improved in strength as those with 25 percent of steel, from which we may infer that the limit of the amount of steel it is beneficial to melt with iron in a cupola, is between 25 and 37½ percent.

Against the Steel Corporation Bond Issue.

At Newark, N. J., on June 16, Vice Chancellor Emory made permanent a temporary injunction secured about ten days ago by Miriam Berger, of Sullivan county, N. Y., restraining the United States Steel Corporation from retiring $200,000,000 of preferred stock and issuing $250,000,000 in bonds instead. R. V. Lindabury, counsel for the United States Steel Corporation, gave notice of appeal. In his opinion the vice chancellor held that the retirement of preferred stock constituted a preferential reduction of the corporation's capital among those assenting to the plan and a corresponding impairment of the rights of those not assenting. According to the vice chancellor's decision, preferred stockholders have vested property rights, which cannot be impaired by a board of directors without the consent of the holders of preferred shares.

The U. Baird Machinery Co., of Pittsburg, dealer in iron and wood working machinery and machinists' supplies, will be succeeded by the Baird Machinery Co. Members of the old firm have been elected officials in the new corporation as follows: H. A. Reed, president; C. A. Wolfe, vice president; O. P. Meckel, secretary. The above, with W. B. Wolfe and J. L. McCartney, constitute the board of directors. The Baird Machinery Co. is exclusive agent in Pittsburg and vicinity of the following machinery manufacturers: Brown & Sharpe Mfg. Co., Providence, R. I.; Prentice Brothers Co., Worcester, Mass.; Hendy Machine Co., Torrington, Conn.; New Haven Mfg. Co., New Haven, Conn.; Gould & Eberhardt, Newark, N. J.; P. Blaisdell & Co., Worcester, Mass.; Draper Machine Tool Co., Worcester, Mass.; B. F. Sturtevant Co., Boston; Acme Machinery Co., Cleveland; Warner & Swasey, Cleveland; Fosdick Machine Tool Co., Cincinnati; J. A. Fay & Egan Co., Cincinnati; Morse Twist Drill & Machine Co., New Bedford, Mass.; Lidgerwood Mfg. Co., New York, Diamond Machine Co., Providence, R. I.; Woodward & Fowell Planer Co., Worcester, Mass., and the Flather Planer Co., Nashua, N. H. The Baird Machinery Co. recently took some large orders for iron and wood working machinery, among these being contracts for the entire machinery equipment of the new works of the Sharon Foundry Co., Sharon, Pa.; Kenney & Co., Scottdale, Pa., and American Turret Lathe Mfg. Co., Warren, Pa. The prospects of the company are extremely bright.

Oliver Watson, of Auburn, N. Y., is at the head of a plan to reopen the Jayville iron mines, on the Carthage & Adirondack Railroad, near Antwerp, N. Y., which have been idle and abandoned for many years. The company is to be capitalized at $250,000. There are 60,000 tons of ore lying on the ground.

PERSONAL.

Henry Hiden, purchasing agent of the Sloss-Sheffield Steel & Iron Co., Birmingham, Ala., has resigned. It is understood that J. J. Ashton assistant to the purchasing agent will be his successor.

A. S. White, formerly traffic manager of the American Steel Hoop Co., Pittsburg, has been appointed general agent of the Mexican Central Railroad and the Interoceanic Railway of Mexico. His headquarters are at St. Louis.

Judge James H. Reed, of Pittsburg, one of the directors of the United States Steel Corporation, received the degree of doctor of laws from Princeton University at the 155th annual commencement held last week.

George F. Harbin has been appointed vice president for the sixth district of the Amalgamated Association of Iron, Steel and Tin Workers to succeed John F. Ward, resigned. The center of this district is at Youngstown, O.

Charles M. Schwab, president of the United States Steel Corporation, delivered the commencement address at Pennsylvania State College last week. At the conclusion of his address he announced that he would erect a chapel for the college to cost approximately $60,000. It was also announced by the trustees that Andrew Carnegie had donated $100,000 for the erection of a library.

Victor Wett, from Dresden, Germany, has just arrived in Pittsburg to accept a position with the Carnegie Steel Co.

T. Shinoda, an engineer representing the Kawasaki Dockyard Co., of Kobe, Japan, spent several days in Pittsburg last week visiting industrial establishments.

The statement published in Chicago papers, and reprinted in these columns, that Superintendent Henry Penton, of the Fraser & Chalmers works of the Allis-Chalmers Co., had resigned, is erroneous.

Ira C. Hubbell, has been appointed assistant vice president and general manager of the Leighton & Howard Steel Co., St. Louis, Mo.

Frank G. Bigelow, president of the First National Bank of Milwaukee, Wis., has been elected a director of the Allis-Chalmers Co.

Vice President Jno. A. Walker, of the Joseph Dixon Crucible Co., of Jersey City, N. J., sailed for Europe Tuesday for a trip of six weeks.

W. Seward Webb has resigned as a director of the Cramp Steel Co., Ltd., of Collingwood, Ont.

A casino in the new library at Swissvale, near Pittsburg, for the erection of which Andrew Carnegie contributed $25,000, will be built by Wm. B. Dickson, of the United States Steel Corporation, at a cost of $25,000.

The Philadelphia Pneumatic Tool Co. is now entirely settled in its new shops at 21st St. and Allegheny Ave., Philadelphia. Considerable loss of time naturally resulted from moving, and the company reports being somewhat behind in making shipments. The works are being run night and day, however, to catch up, and orders will be filled with usual promptness at no distant date. Attention is being attracted to the Keller pneumatic hammers, made by this company, by reason of a recently devised improvement in their construction. On account of this improvement the working capacity of the chipping and riveting hammers is increased 25 percent and the vibration inseparable from any pneumatic tool is reduced materially. This applies to both chipping and riveting hammers. Recent large orders have been received from the Southern Pacific Co., Newport News Ship Building & Dry Dock Co., Pennsylvania Railroad Co., Lackawanna Steel Co., and others.

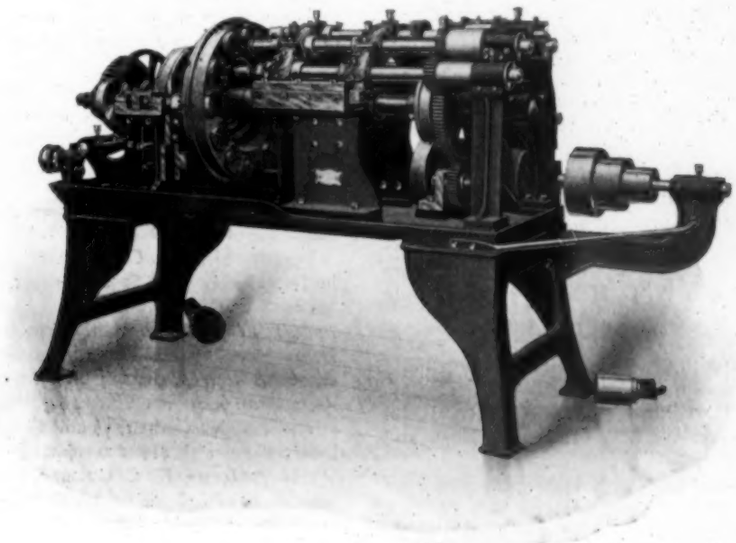
The strike at some of the plants of the Crucible Steel Co. of America started last week spread this week to all the plants of the company in the Pittsburg district except the Howe, Brown & Co. plant, and the men at this plant are expected to go out by the end of the week. The strike affects only the men in the crucible steel melting departments, which are shut down, while other departments of the various plants are running as usual. The men desire an advance in wages of from 10 to 15 percent. At the Howe, Brown & Co. plant mechanical devices are in partial operation to relieve the men from the hottest part of their work.

THE BURNS AUTOMATIC TURRET LATHE.

The machine shown in the illustration has been designed by H. H. Burns, formerly general manager of the Clarksdale Machinery Co., of Clarksdale, Miss., and superintendent of other Western firms. The necessity of rapid methods for the duplication of interchangeable parts in modern manufacturing led the inventor to the production of the present machine which is particularly adapted to the manufacture of oil and grease cups, globe valves and stems, safety valves, injector parts, brass couplings, gasoline and kerosene burner parts, cap and set screws.

There is a revovlving chuck head which contains twelve chucks or collets as the nature of the work may require and five rotating tool spindles which are placed at the same radius as the chucks. The spindles are all contained in one carriage which brings the tools in contact with the work while the chuck head is at rest. At the time the operator is placing castings in one of the chucks or collets a finished casting is being automatically released on the opposite side of the chuck head. By this method one tool does not have to wait upon another and the operator simply supplies the blanks as the chucks or collets make the round of the circle. There is a patent device which tightens the chuck or collet upon the work at any desired tension. On rod work the one operator may run four or five machines as the action is then continuous and the machine can be designed for any variety of chuck or rod and as many spindles as may be desired. The machine will drill, bore, tap, and mill and is thoroughly automatic.

The patent rights have been assigned to the Battle Creek Iron Works Co., Battle Creek, Mich., with which Mr. Burns is now connected as superintendent.



BURNS' AUTOMATIC DRILLING, TAPPING AND MILLING MACHINE.

Southern Iron and Pipe Shipments.

The report of the Southern iron committee for May gives the following figures of shipments:

District.	Pig iron.	Cast iron pipe.
Anniston	21,857	4,942
Birmingham	77,548	7,716
Nashville	8,710	.....
Sheffield	16,248	.....
Middlesboro	3,383	.....
Chattanooga	24,428	4,907
Total	152,174	17,565

The total shipments of pig iron, steel and cast iron pipe from the Southern field, including all of the districts, aggregates 169,739. The shipments of steel during May, all of which came from the Ensley steel plant of the Tennessee Coal & Iron Co., amounted to 11,259 tons. There were exported during last month only 230 tons of pig iron. The cast iron pipe export movement last month amounted to 331 tons.

CINCINNATI MACHINERY MARKET.

CINCINNATI, O., June 17.—The announcement made a short time ago in *The Iron Trade Review* correspondence from Cincinnati that there was likely to be an advance in the price of machine tools caused something of a stir locally. An advance has been considered by various machine tool manufacturers to be desirable and it is understood that during the past week several practically decided to make an advance of a moderate amount. It is hard, however, to secure any definite information as most of those inquired of say that they are not decided. Machine tool business in general is quite good. The demand continues and deliveries are still backward. Inquiry comes from all sections of the country, the South being in the market for all kinds of machinery, as are other sections of the country. From the West also comes a good aggregate of orders for everything that machine tool men build.

There has been something said during the past week or so of the possibility of the removal of the plant of the American Tool Works Co. from Cincinnati to Muncie, Ind. This has been talked of for a good many months and there have been deals a number of times for transferring the company and its business to a new syndicate by whom the removal might be made. Some of the largest stockholders of the concern, however, say that they are not aware of any possibility of a removal and declare that the plant is no nearer being taken to another town now than it was a year ago.

The deal has been closed by which the Cincinnati Shaper Co. secures the property on Blaine St. extending through to Girard between Spring Grove and Colerain Aves., Camp Washington. This is the property on which the company will erect a new building 90x300 feet which it will occupy as soon as it can be completed.

A change has been made in the Fosdick & Holloway Machine Tool Co., Philip Fosdick having purchased the entire interest of J. K. Holloway. Mr. Holloway has been in ill health for some time and is compelled to leave the city. The name of the company will be changed to the Fosdick Machine Tool Co. and the business will continue as heretofore. Mr. Fosdick, speaking of the business of the concern, said that it was extremely good, though mostly domestic. "However," he added, "we are looking for an increased trade in England now that their war troubles are over."

The Block-Pollock Iron Co. has just arranged for another large addition to its plant at Steelton. The new building will be 95x600 feet, will be equipped to turn out heavy shafting 50 inches in diameter. There will be in the new shop a 15-ton hammer and it is expected that the building will be ready for use in 90 days.

The Bradford Machine Tool Co. has recently made a considerable shipment of its specialties to England.

The J. A. Fay & Egan Co. reports numerous inquiries from South Africa.

INDUSTRIAL SUMMARY.

[If you are in need of machinery of any description, please notify *The Iron Trade Review*, and we will put you in communication with our advertisers at once.]

New Buyers in the Market and Some of Their Wants:—

The Howery Mfg. Co. has been organized at Chester, Pa., with a capital of $200,000, all subscribed. The officers are: President, J. D. Howery; secretary, T. Burd Zell, U. S. naval inspector; treasurer, Wm. H. Berry. The work of erecting the plant will be started at once and it is expected that the entire plant will be finished within six months. The works will at first employ 250 men.

The Hoosier Equipment Co., of Richmond, Ind., has been incorporated with a capital of $10,000.

The Moatsville Coal & Coke Co. has been incorporated with a capital stock of $350,000, of which $50,000 has been paid in, by E. H. Douglas, Pittsburg; J. E. Douglas, West Newton; J. E. Plans, Blythedale; John H. Odgson, McKeesport, and E. Felty, Connellsville.

The Lorain (O.) Machine & Forge Co. has been incorporated with $10,000 capital stock by D. H. Aiken and others.

The Philadelphia (Pa.) Steel & Iron Co. has been incorporated in New Jersey with $125,000 capital stock by W. L. Weir, Charles F. Walker and Alfred C. Rex, all of 419 Market St., Camden, N. J.

The Corrington Air Brake Co., New York City, has been chartered under the laws of New York with $5,000,000 capital stock to manufacture air, electric, and other brakes and appliances for locomotives, cars, and vehicles. The directors are: John N. Beckley, Frederick Cook and John F. Alden, of Rochester; K. W. Blackwell, of Montreal; Elias Rogers, of Toronto; Henry W. Watson, of Buffalo; John P. O'Donnell, of London, England, and William G. Choate, Coleman Hanford, Nelson Shipman, Joseph Larocque, Jr., Charles F. Gehrmann, Charles Hansel, Clarence A. Hope, and Murray Corrington, of New York City.

The Helm Mfg. Co., Jacksonville, Ill., has been incorporated with $25,000 capital stock to make articles from wood and iron, by William W. G. Helm, Joel W. Hubble and Edna T. Helm.

The Peerless Electric Co., Warren, O., has been organized by Warren parties with $500,000 capital stock to build a plant in Warren to manufacture electric supplies. The incorporators are T. H. Gillmer, E. M. Gillmer, Jacob Perkins, William Wallace, W. C. Ward, E. E. Nash and J. W. Holloway.

The New Steel & Iron Co., with temporary office on Fifth Ave., Camden, N. J., has been incorporated with $100,000 capital stock to manufacture iron and steel in all its forms by John B. Wood, Horatio C. Wood and Arthur M. Wood, all of Camden, N. J.

The Elkhart (Ind.) Brass Mfg. Co. has been incorporated with $12,500 capital stock, the directors being Herbert E. Bucklen, William H. Anderson, Albert E. Hansen, Frederick A. Reed and Louis Anderson.

The Spencer Machinery Co., Victor, Col., has been incorporated with $5,000 capital stock by Edwin C. Sutton, John S. Spencer and Martha C. Spencer.

C. E. and H. J. Davis, Kansas City, Mo., have bought out the Sieben Mfg. Co. and Sieben & Conity and are forming the Sieben Mfg. Co., with $50,000 capital stock to operate the plants, which will later be enlarged. C. E. Davis will be president, Henry Sieben vice president and H. J. Davis secretary and treasurer.

The Standard Machinery & Supply Co., Wilmington, Del., has been incorporated with $100,000 capital stock to manufacture machinery.

The Michigan Fence Post Co., Capac, Mich., has been incorporated with a capital stock of $40,000, and the following officers have been elected: J. L. Board, president; R. S. Holland, vice president; Robert Morrison, secretary and treasurer.

The Mathews Down Draft Boiler Co., Chicago, has been incorporated with a capital stock of $20,000. The incorporators are George W. Mathews, James C. Ehlman and Dillon B. Hutchinson.

P. O. Box 1535, New Orleans, La., wants second hand standard make wind-jacket cupola of ½ to 1 ton capacity. Send description and price f. o. b. cars. Also wants to communicate with makers of apparatus to heat oven 15x20x7 feet up to 180 degrees F.

The Memphis Buggy Co., Memphis, Tenn., has been incorporated with a capital of $100,000.

Davis & Co., Hattiesburg, Miss., has been incorporated to manufacture and repair machinery, with a capital of $20,000. Wm. Davis, H. C. Ruff and V. E. McInnis are the incorporators.

J. E. Minter, 136 Cole street, Macon, Ga., wants air compressor and reservoir for small plant.

The Birmingham Drop Forge & Machine Co., Ensley, Ala., recently organized, has elected officers as follows: Wm. E. Nicholls, president; J. M. Perkins, vice president; and A. F. DeFuniak, secretary and treasurer. The company will at once build a plant.

Bowen & Street, 600 Citizens' Bank Bldg., Norfolk, Va., is in the market for a 250-horsepower Corliss engine.

The New Process Metal Rolling Machine Co., 332 Harrison Ave., Harrison, N. J., has been incorporated with $125,000 capital stock by Warren C. Clouse, Wm. L. Jones, Neil Andrews, Harry L. Bennett, James L. Terhune, May Crane and John D. Crane.

The Wichita Bridge & Iron Co., of Wichita, Kan., has been incorporated with $25,000 capital. The new company is a consolidation of the Wichita Bridge Co., Wichita Manufacturing Co. and the Globe Iron Works. Officers have been elected as follows: G. H. Bradford, president; Henry Anthony, vice president; E. D. Miles, secretary and engineer, and J. F. Warren, treasurer.

The Atlas Coupling Co., has been incorporated in New Hampshire with $100,000 capital and officers have been elected as follows: Dr. W. W. Nutting, president; J. E. S. Hall, treasurer; H. T. Meriam, general manager. The main office of the company is at Boston, Mass. The company will manufacture the Mooney coupler which is designed to do away with the threading of pipe.

The United States Charcoal Iron Co., has been incorporated in New Jersey with $250,000 capital by J. J. Hudson, P. A. Maxwell and J. O. Wilson.

W. F. and H. W. Wendt, of the Buffalo Forge Co., Buffalo, N. Y., have organized a company with $100,000 capital to be chartered under Canadian laws for the purpose of etstablishing a large forge manufacturing plant in Canada.

The Hayden-Corbett Chain Co., Columbus, O., has been incorporated with $100,000 capital by J. W. Hayes, J. D. Price, W. H. Andrews, H. C. Godman, W. C. Orr, W. H. Hayden, and others of Columbus. W. C. Brown has been elected president; W. H. Hanna, vice president; J. W. Dodges, treasurer; W. H. Hayden, secretary, and J. T. Corbett, general manager. The company will erect two buildings each 300x50 feet and will install 100 forges.

The Redding Iron Works, Redding, Cal., has been incorporated with $25,000 capital. E. E. Todd, I. J. Johnson, C. A. Carlson, C. B. Todd, and M. B. Johnson are the incorporators.

The Beilfuss Motor Co., for the manufacture of gas engines, has been incorporated at Lansing, Mich., with $4,500 capital. E. N. Reitz has been elected president; R. A. F. Beilfuss, vice president and superintendent and John F. Betz, secretary and treasurer.

The Reason Automatic Air Pump Co., Pontiac, Mich., has been incorporated with $25,000 capital to manufacture air pumps. W. Reason has been elected president; A. G. North, vice president; F. G. Jacobs, treasurer, and H. A. Wright, secretary.

New Construction:—

The Ohio Cultivator Co., Bellevue, O., is contemplating the erection of a steel forge and blacksmith shop, 65x200 feet.

The Chattanooga Stove Co., Chattanooga, Tenn., has contracted for the erection of an additional building, four stories high, 50x150, to cost $15,000.

The Alabama Consolidated Coal & Iron Co., Gadsden, Ala., instead of rebuilding its Gadsden furnace, as recently announced, will build an entirely new stack adjacent to

the present stack. T. G. Bush, Birmingham, is president.

The National Automobile Co., Oshkosh, Wis., it is reported, propose erecting a manufacturing plant in that city.

R. Herschel Mfg. Co., Peoria, Ill., has had plans prepared for the erection of five buildings, for which will be needed, freight elevators, electric machinery, boiler, engine, steam pump, etc.

The American Steel & Wire Co. has started enlarging its galvanized department at De Kalb, Ill., by the erection of two buildings, 30x60 feet and 30x100 feet, both to be of light brick.

The D. E. Whiton Machine Co., New London, Conn., has purchased land to erect a foundry, 60x60 feet, with a 40x60-foot L.

The P. A. Club Co., Rochester, N. Y., now operating a brass foundry at No. 18 Jay St., employing 80 men, has purchased ground on Lyell Ave., and will erect a brass foundry 100x329 feet of wood and corrugated iron and brick.

The Stanley Works Co., New Britain, Conn., making butts, hinges and bolts, will erect six new factory buildings.

The Link-Belt Machinery Co. will extend its machine shop at Nicetown, Philadelphia to form a craneway.

The American Pipe & Foundry Co., in which W. J. Long, of Birmingham, Ala., and others are interested, has completed the purchase of land in Birmingham for the plant.

The West Virginia Iron Co. has made a proposition to Parkersburg, W. Va., to locate a $250,000 plant in that town.

The Miskinnen Furnace Co., of Newcomerstown, O., will probably locate at Logansport, Ind., in consideration of local capitalists taking stock. The company proposes to make warm air furnaces. At first a local foundry now established will furnish the castings.

The Norristown Iron Co., of which H. H. Light is president and general manager, and S. P. Light secretary and treasurer, will remove its plant from Norristown to Lebanon, Pa., where a plant will be erected adjoining the East Works of the American Iron & Steel Mfg. Co. Ground will be broken in a few days. The buildings will be 360x117 feet in the aggregate. The plant will consist of a puddle mill and two finishing mills, making from 75 to 100 tons of finished material a day. The company is capitalized at $150,000. The Norristown plant was rebuilt two years ago and has been operated successfully since then.

Ground has been broken at Woodward, a few miles south of Birmingham, Ala., by the Woodward Iron Co. for a new blast furnace, in addition to the two the company now operates there. The new furnace will produce from 200 to 300 tons a day.

The Detroit Brass Works, Detroit, Mich., has bought about three-fourths of an acre more ground at Detroit, for $3,000 and will extend its plant.

Special designs of steel telegraph poles and malleable iron castings will be manufactured by the Franklin Rolling Mill & Foundry Co. at Franklin, Pa. S. Diescher & Sons, Pittsburg, are drawing the plans.

The Illinois Car & Equipment Co., at whose works on 130th St., Chicago, a fire destroyed the wood planing mill, individual power plant and all machines, is making plans for a new shop which will be operated by electricity. New tools will be purchased at once and it is hoped to resume by Aug. 1.

The Mississippi Foundry & Machine Co., Jackson, Miss., will extend its farm implement business and has increased its capital stock from $20,000 to $30,000.

Work on the new factory of the Caldwell Mining Car Co., of Caldwell, O., will begin at once. The company's capital is $100,000.

The Flickinger Iron Works, of Bradford, Pa., will erect new buildings so as to double the present output. The plant at Cochranton will be abandoned.

A contract has been made at Philadelphia for the structural steel work of a large machine shop, foundry and other buildings for the new mining and pump manufacturing plant of the Jeanesville Iron Works, to be erected between Jeanesville and Hazelton, Pa. The main building will be 540 feet long by 106 feet wide, having monitor and arranged for electric traveling cranes.

The Steele & Robinson Co., recently incorporated at Williamsport, Pa., with a capital of $50,000, will remodel to suit their own business the plant formerly used for making the Backus heater and will make gray iron castings, radiators and stoves and hot water heaters. They will employ 50 men.

Chas. Clifton, of Matthews, Ind., is said to be at the head of a project to build a steel casting plant in that city.

The Champion Iron Works, whose buildings were recently destroyed by fire, will remain at Kenton, O., as the citizens have voted favorably on issuing $50,000 bonds to be used for the rebuilding of the plant. The new plant will be double the capacity of the old.

The Structural Steel Car Co., of Canton, O., whose large plant is not yet finished, will erect buildings to double the output as soon as the first shops are completed. This company may also erect a blast furnace and a steel plant to produce its own material.

J. T. Carmody, proprietor of the Carmody foundry, engine and machine works at Cedar Rapids, Iowa, is rebuilding the plant. The building occupied by the machine and pattern shops, which is now nearly completed, is two stories—40x120 feet. Mr. Carmody is also erecting a new foundry building 60x170 feet with traveling crane and overhead circular hoists. The foundry will have two modern cupolas, one of 10 ton, and one of 20 ton melting capacity per hour. All the material and equipment for the foundry is already on the ground, and will be erected ready for use in about sixty days. All necessary equipment is on hand for installing a set of pneumatic hammers, riveters, etc., in the boiler shop.

At a recent meeting of the directors of the William Tod Co., of Youngstown, O., it was decided to enlarge their plant materially. Among the additions will be a new erecting shop of 70 feet, crane span and 70 feet high by 200 feet long, provided with two 50-ton cranes, with 10-ton auxiliary hoist; an additional machine shop of 50 feet span, 50 feet high by 200 feet long, which will also be equipped with proper crane capacity; a forge shop 30x150 feet, and a new boiler plant. The company is purchasing sufficient large and small tools to enable it practically to double its present capacity. The contracts for buildings and some machinery have already been placed, and as the work is being pushed rapidly, it is expected to have the improvements in operation in a few months, when the company will be in position to take considerably more work than it now has on hand.

The Baldwin Locomotive Works, Philadelphia, Pa., has commenced work on the erection of a two-story steel foundry building which will be 400 by 80 feet.

A temporary structure will be erected by the Robinson Machine Co., Monongahela, Pa., and will be operated until the new plant can be completed which is to take the place of the one recently destroyed by fire. Considerable of the work of the plant is now being done by outside concerns but when the temporary structure is completed the company will be able to do nearly all its own work.

The Tacoma Brass & Machine Co., Tacoma, Wash., is erecting a new brass foundry 60x60 feet.

Ground has been broken for the new plant of the Grand Crossing Tack Co., Grand Crossing, Ill. It will be nearly a year before it can be placed in operation.

General Industrial Notes:—

The H. Haller Mfg. Co., of New Orleans, manufacturer of tinware and stamped goods, has been purchased by the National Enameling & Stamping Co., which has a capital of $30,000,000 and branches in many Northern cities. It is announced that the New Orleans factory will be used mainly for the manufacture of tinware for the West Indian and Central and South American markets.

The Niles (O.) Car & Mfg. Co. will ship its first cars about July 1.

The shipbuilding business of the Delaware River Iron

Shipbuilding & Iron Works, under which name the old Roach yards at Chester, Pa., have been operated, has been secured by a new company, the Delaware River Ship & Engine Building Co., with a capital of $5,000,000, which has been incorporated in Trenton, N. J. The following are the officers; John B. Roach, president; Osborn Congelton, vice president; E. L. Levy, of Neafy & Levy, ship builders, secretary, and D. E. Ford, treasurer and general manager.

Engine sales of the Allis-Chalmers Co. in May included the following: Wolf River Paper Co., Shawano, Wis., one 18x36-inch and one 22x48-inch 1890 frame Reynolds Corliss engines; Southern Cotton Oil Co., New York City, one 14x36-inch, and four 18x42-inch girder frame Reynolds Corliss engines; Devoe & Raynolds Co., Chicago, 22x42-inch 1890 frame Reynolds Corliss engine; Carnegie Steel Co., Pittsburg, five pairs vertical cross compound blowing engines, with steam cylinders 46 and 86x60 inches, air cylinders, 84 and 84x60 inches; Jones & Laughlins Co., Ltd., Pittsburg, 79-inch air cylinder; Rapid Transit Subway Construction Co., New York City, two combined vertical and horizontal Reynolds Corliss engines, cylinders, 42 and 86x60 inches; Union Steel Co., Pittsburg, three 26x52x48-inch horizontal cross compound direct coupled Reynolds Corliss engines; Willis Coal & Mining Co., Murphysboro, Ill., 18x42-inch girder frame Reynolds Corliss engine; Gunther Foundry Machine & Supply Co., San Antonio, Texas, 16x36-inch girder frame Reynolds Corliss engine; Buffalo Union Furnace Co., Buffalo, vertical long crosshead blowing engine, steam cylinder 42x60 inches, air cylinder 84x60 inches; Studebaker Bros. Mfg. Co., South Bend, Ind., 22x44x42-inch 1890 frame horizontal cross compound direct coupled Reynolds Corliss engine; Colorado Milling & Elevator Co., for Monte Vista Mill, Colorado, 14x36-inch girder frame engine; Great Western Gold Co., California, one 14x36-inch Reynolds girder frame Corliss engine; Park City Sampling Mills, Utah, one 16x36-inch Reynolds 1890 frame Corliss engine.

The Enamel Steel Tile Co., Zanesville, O., will be capitalized at $50,000 instead of $40,000 as originally intended.

The Muskingum Valley Steel Co., Zanesville, O., has about completed its fifth sheet mill.

At the suit of the Peck-Williamson Heating & Ventilating Co., United States Marshal Cooper levied upon certain property at Fort Payne, Ala., of the Caldwell Furnace Co. on a writ of detinue for $37,500. The defendant company makes warm air furnaces and closet castings and the property seized consisted of 781 flasks and 1,500 furnace and closet handles.

It is stated that the Colorado Fuel & Iron Co. will buy, when its new furnace is completed, fully 5,000 tons of manganese ore a month in the Leadville, Col., district.

W. J. McBride, presumably representing the American Car & Foundry Co., has purchased 75 acres of land at Bakersport, Ky., for $7,500.

The Springfield (O.) Machine Tool Co., recently shipped a large quantity of tools to Stockholm, Cologne, Brussels, Paris, Berlin and Melbourne.

The Republic Iron & Steel Co., which is rebuilding the Springfield, Ill., plant, expects to start the puddle mill, muck mill and 22-inch mill shortly after July 1, to be followed later by the 9-inch and 16-inch mills. The puddling department, which is now practically completed, consists of 11 double puddling furnaces and four double scrap furnaces.

Pilling & Crane, Philadelphia, owning the two Pioneer furnaces and the Pottsville Rolling Mills, at Pottsville, Pa., idle for five years, have formed a syndicate with $1,000,000 capital to buy the property for $200,000 and put the rolling mills in operation, besides making extensive improvements. The plant contains two 20-ton basic open-hearth steel furnaces, with a 32-inch blooming mill, and four trains of rolls with 35,000 tons annual capacity, single turn, producing various structural shapes, bars and shafting.

The Cincinnati Iron Store Co., Plum and Pearl Sts., Cincinnati, O., has increased its capital stock from $50,000 to $100,000, in order to handle structural steel throughout the South. A beam yard and some warehouses will be established.

No. 3 furnace at Thomas, Ala., put in blast June 9 by the Republic Iron & Steel Co., is now making close to 300 tons a day.

The National Iron Works will move from its Garfield Ave. location in Duluth into the Iron Bay plant at West Duluth instead of erecting a new building, as was at first intended. A lease was taken which it is understood includes an option to buy. New machinery will be added and repairs made.

Ashland, Wis., papers report that H. G. Haskill, representing English capital, has been in that city securing options on lands in the vicinity and looking over mining lands south of Ashland. These investigations are thought to point to the establishment of a blast furnace at Ashland.

The Penn Iron & Coal Co., of Canal Dover, O., has increased its capital stock from $200,000 to $500,000 and will build a new blast furnace on the site of the present one, also a system of structural steel bins and trestles, and a steel bridge over the ore yard with electric trolley cars. The present furnace, which is 16½ by 70 feet, will be blown out in a few weeks and work will be begun on the new furnace, most of the materials being on the ground now. The new stack will be 85x20 feet and will have a daily capacity of 400 tons.

The Fosdick & Hollaway Machine Tool Co., Cincinnati, O., has changed its name to the Fosdick Machine Tool Co.

The plant of William B. Pollock & Co., Youngstown, O., was placed on double turn this week. This was done to double the output of the plant owing to the immense amount of work now on the company's books.

The new plant of the Gadsden Pipe & Foundry Co., Gadsden, Ala., was placed in operation last week and the first cast was successfully made in the foundry. The company has a large number of orders on its books and there is every indication that the plant will have to be enlarged in the near future.

The Pittsburg District:—

Furnace A, of the Edgar Thomson group at Braddock Pa., of the Carnegie Steel Co., an 80x15½-foot stack which has been running on ferro-manganese, has been blown out for extensive repairs. When it resumes it will make Bessemer pig.

The new Talbot open-hearth steel furnace of Jones & Laughlins, Ltd., made its first cast, 40 tons, Monday evening of last week. During the week it produced 415 tons of good steel, and this week the output is expected to be considerably increased. In the course of a month or two the furnace should be making its rated output of 400 tons a day. Several minor changes have had to be made in the equipment as a result of experience with the furnace.

The Kirby-Williams Co., 216 S. Main St., Pittsburg, has been formed to deal in merchant pipe, as well as second hand pipe and machinery and do pipe cutting, threading and bending. The firm is composed of John T. Kirby and John Williams.

The Railway Steel Spring Co. of America has increased the membership of the executive committee from three to five, adding as members Frank S. Layng, first vice president, and Charles Scott, Jr., second vice president. Mr. Layng was formerly president of the Pickering Spring Co., Ltd., Philadelphia, and Mr. Scott was formerly head of the Charles Scott Spring Co., Philadelphia.

The consolidation of fire brick makers will be known as the Harbison-Walker Refractories Co., instead of the American Refractories Co. Application for the charter will be made to the governor of Pennsylvania June 30. S. C. Walker, of the Harbison-Walker Co., is slated for the presidency. Final plans for the consolidation have not yet been completed.

It is reported that C. H. Halcomb, who recently retired from the presidency of the Crucible Steel Company of America, is negotiating with several independent makers with a view of securing control of a plant, and if this is not successful intends to erect a competing plant for the manufacture of crucible steel. Mr. Halcomb came from the Sanderson Bros. Steel Co., of Syracuse, N. Y., but it is understood he proposes to operate in Western Pennsylvania with his independent plant.

The New Process Steel Co., Homestead, Pa., held a meeting Monday last to increase the capital stock from $100,000 to $3,000,000. The company is promoted by J. H. Kendin, 133 W. 15th Ave., Homestead, employed at the open-hearth department of the Homestead Steel Works.

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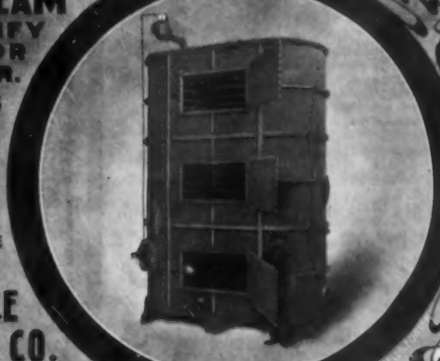

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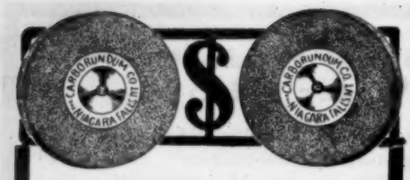

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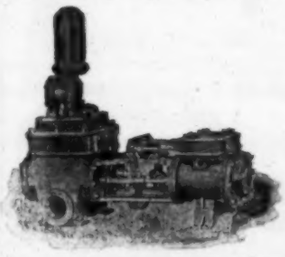

is always ready to do your pumping as long as you have steam at your command. It will pump sandy and impure water which other pumps cannot handle. There being no valves on the **Blakeslee Jet Pump,** there is nothing to wear out nor anything to get out of order. Coupled with reliability under all conditions the **Blakeslee** shows exceptional economy.

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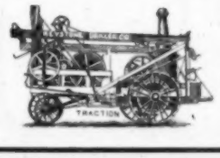

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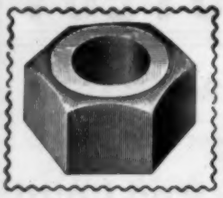

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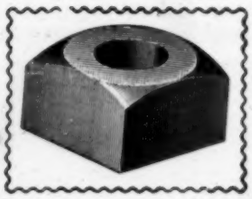

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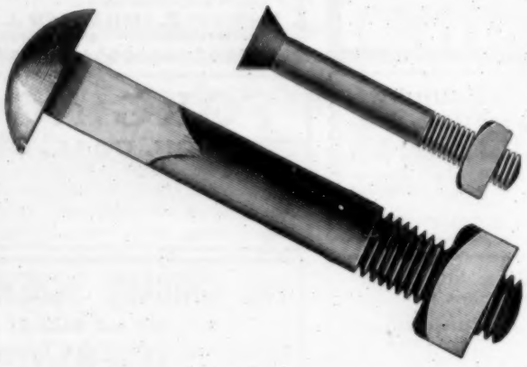

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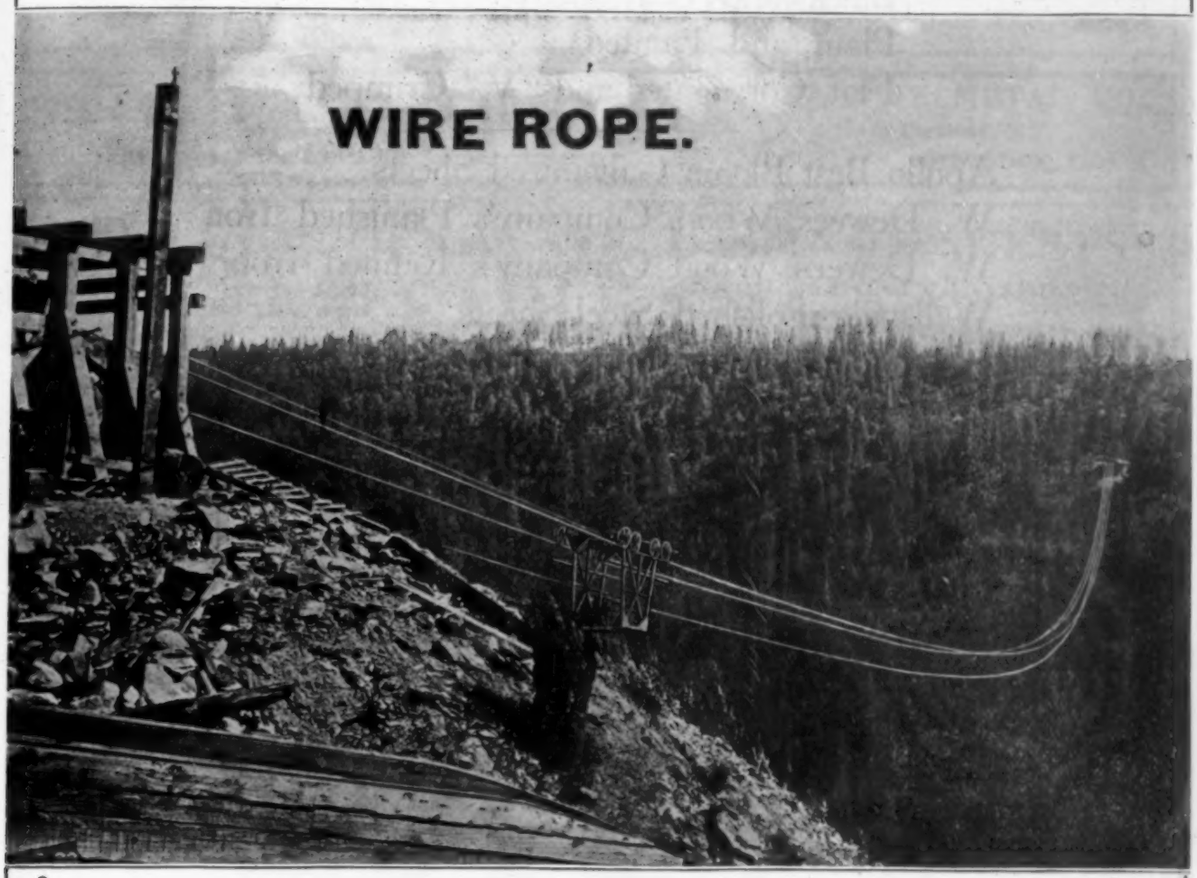

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